2004 Integrated Pest Management Survey of California School Districts

Prepared for the California Department of Pesticide Regulation
by the Institute for Social Research at California State University, Sacramento

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PURPOSE

The Department of Pesticide Regulation (DPR) surveyed all public school districts in California in April 2004. The purpose of the survey, conducted by DPR's Pest Management Analysis and Planning program, was to: (1) measure compliance with requirements of the Healthy Schools Act (HSA); (2) measure adoption of integrated pest management (IPM) policies; programs, and practices; (3) identify barriers to IPM adoption; (4) examine changes over time relative to prior surveys conducted in 2001 and 2002; and (5) relate demographic and geographic factors to survey responses. In addition, survey results and analyses will guide future IPM training efforts by DPR.

BACKGROUND

The HSA (enacted in 2001) aims to reduce exposure of children to pesticides in schools through the voluntary adoption of IPM and least-toxic methods of pest control. The law defines IPM as a means of preventing and suppressing pest problems using a combination of monitoring and recordkeeping, establishing pest thresholds, and non-chemical methods of pest management. Chemical controls that pose the least possible hazard to human health and the environment are used only after careful monitoring and pre-established thresholds and treatments indicate their use is necessary.

The law requires school districts to:

- Keep a registry of parents and guardians interested in notification of pesticide applications;
- Notify parents and guardians of specific pesticides applied in schools;
- Post signs on school grounds if pesticides are applied; and
- Keep records of pesticide applications for four years.

DPR is required to provide training to school district staff to facilitate the adoption of effective IPM programs and practices at school sites. DPR began with a pilot workshop in June 2002, followed by nine additional workshops held through June, 2004. A total of 232 school districts had been trained prior to completion of the 2004 SIPM survey.

DPR's 2001 (conducted before DPR training had begun) served as a baseline for all subsequent surveys (Tootelian, 2001), and also aided DPR's IPM training efforts.[i] Analysis of survey responses led to improvements in how the 2002 survey was conducted (Geiger and Tootelian, 2003).[ii] The 2004 survey was modified further for clarity and to collect additional information. This report describes the 2004 survey results and statistical analyses performed by scientists from the Institute for Social Research at California State University, Sacramento.

METHODOLOGY

Surveys were mailed to IPM coordinators of 972 school districts statewide in April 2004. The survey contained 24 questions grouped into four sections.

The first section contained questions about general pest management practices including the district's compliance with HSA requirements, adoption of IPM policies, programs and practices, and barriers to using IPM in a school district. The next two sections focused on ant and weed management methods used by the districts. The last section contained questions regarding respondent information and determined pest management responsibilities and general job classification.

Responses to individual questions were compiled and relationships among these questions and district characteristics quantified. Trends in response rates occurring since 2001 were also analyzed. In addition, multiple questions concerning IPM policies and practices were reduced to six scale scores so it would be easier to compare responses. The six scales measure a school district's:

1) HSA compliance
2) IPM program
3) Awareness of IPM information resources
4) Use of IPM information resources
5) Ant management practices
6) Weed management practices

The first four scales are simple numerical summations of the number of policies, activities or resources a district has adopted, engaged in, or used.

The ant and weed management scales are more complex, involving weighted combinations of specific management practices. Univariate and multivariate analyses were used to identify relationships among these scales, IPM program adoption, district and respondent characteristics, as well as perceived barriers to implementing IPM.

RESULTS

Survey Response Rate

The survey response rate was 55% (533 of 972 school districts returned the survey), an increase from 39% and 42% in the 2001 and 2002 surveys, respectively. Although the initial response rate was similar to prior years, a second mailing was employed and improved the response rate by more than 10 percentage points.

HSA Compliance and the Adoption of IPM Policies and Practices

Almost all school districts post warning signs (92%) and provide written notification of pesticide use (88%). Seventy-nine percent keep a registry and 77% keep pesticide use records up to four years. Approximately two-thirds (64%) comply with all four of these HSA requirements, while another 22% complied with three of the four. Only 5% of districts had failed to comply with any of the Act's requirements. However, some of the "non-compliant" districts are exempt from the Act's requirements because they do not use pesticides.

In contrast, fewer districts use general IPM practices that are associated with the voluntary aspects of the law. Between 31% and 67% have written policies regarding pesticide use and pest management while recordkeeping and pest monitoring activities range from 25% to 88%. School districts are therefore much more likely to comply with the mandatory requirements in the HSA, than they are to adopt IPM-related policies or practices that are voluntary.

HSA compliance is greater in districts that have adopted an IPM program and have higher scores on the IPM program scale—activities related to the requirements of the HSA and incorporate what districts define as an IPM program. In contrast, compliance actually decreases with increasing costs per student—a function, perhaps, of the greater costs of educating children in rural areas and the lower HSA compliance rates of rural districts. Use of IPM information resources is also strongly related to higher scores on the HSA compliance scale, particularly for districts that have not adopted an IPM program. Together, these four variables explain almost a third of the differences in HSA scores.

Trend: *DPR's School IPM training program, Web site and brochures have successfully encouraged significant improvement in compliance with each of the four HSA requirements between 2002 and 2004. Mean scores on the HSA scale increased significantly, reinforcing this trend.*

Adoption of district policies supportive of IPM also increased significantly over this two-year period. Districts were more apt to maintain a list of pesticide products approved for use in their schools in 2004 and many also had a written policy requiring use of the least-toxic pest management practices.

IPM Program Adoption

Districts are more likely to adopt IPM-related policies, monitor pest levels, and keep records of pest monitoring and treatments if they have adopted an IPM program, have higher average daily attendance (ADA) and greater compliance with the HSA. The data presented here may understate the existence of IPM policies and practices since one in seven respondents was not the district's IPM coordinator and IPM coordinators were more aware of policies and practices associated with the HSA than non-coordinators.

Region, type of district, and ADA are all significantly related to adoption of an IPM program. Districts in the Central Coastal region and unified school districts are much less likely and high schools much more likely to have adopted an IPM program. Size—measured by either ADA or the number of schools in a district—increases the likelihood of program adoption. Size also affects how long such a program has been in effect. Larger school districts tended to be the early adopters while smaller districts are more apt to have instituted their IPM program in the past two years.

A lack of resources also strongly affects the ability of a school district to adopt an IPM program. School districts where understaffing and staff training were perceived as very significant barriers to using IPM practices were less likely to adopt an IPM program.

Districts with an IPM program are much more likely to have a written policy requiring the use of least-toxic pest management practices and a written list of approved products than those without one. However,

all districts, with or without an IPM program, are less apt to have a written policy requiring the monitoring of pest levels. In addition, districts with an IPM program are more likely to keep records of pest sightings and treatments, and inspect and monitor for pests, than those without an IPM program.

Trend: *Recordkeeping and pest monitoring have improved markedly over the three survey years. 79% of school districts kept records of pest treatments used in 2001, with increases to 86% and 88% in 2002 and 2004. The greatest change occurred in the proportion of districts that kept records of pest sightings (that is when pests were first found), from 11% in 2001 to 55% in 2004. Over the same period, there was a more modest increase in the proportion of school districts that recorded the results of pest monitoring efforts.*

Almost half of all respondents in 2004 felt their IPM program resulted in more effective pest management, a significant increase from 41% in 2002.

Ant Management Practices

Over four-fifths of school districts did something to manage ants inside school buildings within the 12 months before the 2004 survey. IPM-based ant management practices occur more often in districts that have adopted an IPM program and score highly on the IPM policy, monitoring and recordkeeping scale. The most common practices used to manage ants inside school buildings were improved sanitation (80%) and ant baits (69%). Only 16% reported use of an insecticide spray from an aerosol can. However, pesticide-based practices are still seen as very effective; respondents were more likely to identify non-aerosol and aerosol insecticides as "very effective" than any other ant management practice.

Trend: *Ant baits and insecticidal sprays were used by more school districts in 2001 than any other practice. The use of insecticidal sprays dropped in 2002 and 2004, while the use of ant baits, soapy water sprays, caulking and improved sanitation increased in each successive survey year. When asked which method was used* ***most frequently*** *to manage ants inside school buildings, respondents indicated that, in 2001, insecticides were the most common—a number that was halved in the 2002 and 2004 surveys. Ant baits became the method of choice in the two later surveys with improved sanitation the only other widely preferred single method of managing ants.*

Weed Management Practices

Weed management is commonplace in California schools. A third of the districts rely upon an IPM-based method for weed management but a large proportion of respondents do not perceive these methods as "very effective".

A majority of districts still depend upon pesticide-based methods. In particular, school districts in North Central and the Central Valley regions were less likely to use IPM-based weed management practices. IPM-based practices occurred more often in school districts with higher average costs per ADA.

Trend: *In 2001, nearly one-third of all school districts identified athletic fields and playgrounds (combined) as the single most common area for problems with weed management. In 2002 and 2004 that dropped to 22% and 12%, respectively. In 2001, the most frequently used practices for managing weeds were spot treatment with herbicides and physical controls such as hand pulling, cultivating, and mowing. Physical controls and spot treatment with herbicides remain the single most common practice in 2004, but over half of all districts also use mulches, while slightly less than half use irrigation management, and even fewer, broadcast treatment with herbicides and turf selection.*

Fencerows (30%) and landscaping (25%) were reported as the single most common locations where districts had trouble with weeds. Relatively few respondents mentioned athletic fields (9%) and playgrounds (3%)—locations receiving significant attention in DPR's workshops and surveys. The practices used most frequently to manage weeds in these locations were spot treatment with herbicides (40% for athletic fields and 48% for playgrounds) and physical controls (35% for athletic fields and 34% for playgrounds). However, about one-third of the districts view the IPM related practices for weed management as "very effective" while 77% and 59% view spot and broadcast treatments, respectively, in this way.

Barriers to Using IPM Practices

Middle-sized school districts were more apt to experience four barriers to using IPM practices in their school districts: poor communication, budget restrictions, understaffing and a lack of technical information resources. Similarly, budget restrictions and inadequate staff training are more of a problem for districts with average costs per ADA. In contrast,

understaffing becomes a less significant barrier as costs per ADA increase.

The perceived barriers to using IPM practices were strongly related to scores on three scales: specifically, those measuring HSA compliance, IPM programs, and ant management. Respondents from districts that score significantly lower on these three scales describe inadequate staff training, understaffing, insufficient tool/equipment inventory and a lack of technical information resources as "somewhat" or "very significant" barriers.

These findings suggest several ways in which DPR can assist school districts in adopting IPM practices. For districts where understaffing constitutes a significant barrier, DPR could develop less labor-intensive IPM methods or help prioritize pest control needs. DPR can also help districts with staff training and expand its efforts to distribute technical information.

Pest Management Information Resource Awareness and Use

Resources used most often by IPM coordinators are DPR's brochures and School IPM Web site, followed by information provided by licensed pest control businesses, and training workshops on school IPM. The most important predictor of use of IPM information resources is participation in DPR training. Respondents from districts that had participated in DPR training were significantly more likely to have used information resources.

In general, respondents from rural areas– and the North Coast in particular—were less aware of and less apt to use IPM information resources, while those representing larger districts, high school districts, and districts that had participated in DPR's IPM training were much more aware and more likely to have used this information.

IPM coordinators were more aware of IPM information resources than respondents who did not serve in this capacity. The coordinators' awareness and use increased with tenure in the job. Respondents in administrative positions were less aware of the resources and were less likely to use the resources than respondents in other positions. Manager/supervisors of maintenance and operations staff were the real experts in using information resources. They were more likely than the director/coordinators to use information resources, especially when neither served as the IPM coordinator.

Major Findings and Conclusions

Description of 2004 IPM Policies and Practices

- School districts are much more likely to comply with the requirements of the HSA, which are mandatory, than they are to adopt IPM-related policies or practices, which are voluntary.
- Almost two-thirds of the school districts had complied with four requirements of the Act, while another 22% had complied with three of the four. Only 5% of districts had failed to comply with any of the Act's requirements. However, some of the "non-compliant" districts are exempt from the Act's requirements because they do not use pesticides.
- At least 70% of California's school districts have adopted an IPM program.
- Districts that have an IPM program are much more likely to have a written policy requiring use of the least-toxic pest management practices and a written list of approved products. They are also much more likely to keep records of pest treatments used (95%), inspect buildings for potential pest problems (66%) and monitor pests during the course of a year (60%).
- School districts use IPM-based ant management practices more frequently than IPM treatments for weeds.
- In 2004, the most common practices used to manage ants inside school buildings were improved sanitation (80%) and ant baits (69%).
- Despite improved practices, respondents identified insecticides as "very effective" more often than any other ant management practice.
- A majority of districts still depend upon pesticide-based weed management practices.
- Fencerows and landscaping were the most common locations where districts had trouble with weeds. In contrast with prior surveys, relatively few respondents mentioned athletic fields and playgrounds—locations receiving greater attention in DPR's IPM training program.
- Resources used most often by IPM coordinators are DPR's brochures and school IPM Web site, followed by information provided by licensed pest control businesses and DPR's training workshops.

Relationships between District Characteristics and IPM Policies and Practices

This study determined that there are significant relationships between district characteristics and IPM policies and practices.

Larger school districts are more involved with IPM. This may be due to their early involvement in DPR's training workshops. Specifically, they are more likely to:

- Adopt an IPM program.
- Adopt IPM-related policies, monitor pest levels and keep records of pest monitoring and treatments.

Two other characteristics related to district size are associated with greater IPM involvement.

- Unified school districts are more likely than elementary districts to have adopted an IPM program.
- Urban districts are more likely than certain rural districts to utilize IPM-compatible ant management practices.

Regional differences were generally found to be less important than other district characteristics.

- Districts in the Central Coast region are less likely to adopt an IPM program.
- Districts in the North Central and Central Valley regions are less likely to use IPM-compatible weed management practices.

Districts that have adopted an IPM program are:

- More compliant with the HSA;
- More likely to adopt IPM-related policies, monitor pest levels and keep records of pest monitoring and treatments; and
- More likely to use IPM-compatible ant management practices.

Pest Management Information Resources

Using pest management information resources—including the DPR School IPM Web site and DPR presentations and training—is associated with greater commitment to IPM. School districts that use more information resources are more likely to:

- Adopt an IPM program;
- Be in compliance with the HSA; and
- Adopt IPM-related policies, monitor pest levels and keep records of pest monitoring and treatments.

Barriers to Using IPM

Only two barriers to using IPM practices, understaffing and inadequate training, were strongly related to district IPM practices and policies. Districts that describe understaffing as a very significant barrier to using IPM practices are less likely to:

- Adopt an IPM program or IPM-related policies;
- Monitor pest levels and keep records of pest monitoring and treatments; and
- Use IPM-compatible ant management practices.

Districts that describe inadequate staff training as a very significant barrier to using IPM practices are less likely to have adopted an IPM program.

Progress in Implementing IPM: 2001 - 2004 Trends

A trend analysis of three survey years (2001, 2002 and 2004) indicates that significant progress has occurred in complying with the requirements of the HSA and meeting the goal of increasing IPM policies and practices in California's school districts.

- Compliance with each of the four HSA requirements increased between 2002 and 2004. Adoption of district IPM policies increased significantly over this two-year period.
- In 2004, districts were more apt to maintain a list of approved pesticide products and to have a written policy requiring use of the least-toxic pest management practices. Twice as many districts had introduced a policy of requiring the monitoring of pest levels.

More respondents in 2004 also felt that their IPM program had resulted in more effective pest management, although there was no change in the proportion that felt it had reduced the long-term cost of pest management.

Recordkeeping and pest monitoring activities improved markedly over the three survey years. Maintaining records of pest sightings jumped from 11% to 55% while recording the results of pest monitoring increased from 15% to 25% of all districts. Recording pest treatments used was already widespread in 2001 (79%), but other districts have adopted this practice, raising the percentage to 88% in 2004.

Most importantly, ant management practices have dramatically improved. Ant baits and insecticidal sprays were the most common practices in 2001. Ant baits became the method of choice in the later surveys with improved sanitation the only other widely preferred single method of managing ants. The use of insecticidal sprays as the most frequently used method of managing ants inside school buildings was halved between 2001 and the two later surveys.

Future Training Recommendations

The 2004 survey findings suggest that assistance with IPM program adoption, written IPM policies, and monitoring and recordkeeping activities would be helpful to schools in adopting both the mandatory and voluntary aspects of the HSA. The location where weeds cause the most problems for schools has shifted to fencerows and landscaped areas. School districts need further training in IPM for weeds, particularly in those locations. In addition, information on the costs of implementing IPM, less labor-intensive IPM methods, and prioritizing pest control needs would help school districts facing budgetary and staffing constraints. Finally, the focus of past DPR training efforts had logically been in areas with the highest density of schools and school districts. As these communities become better educated and more aware of training resources, more emphasis on training for smaller districts in more rural areas may be warranted since results indicate DPR training is associated with greater commitment to IPM.

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[i] Tootelian, D.H. (2001). 2001 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[ii] Geiger, C.A. and D.H. Tootelian (2003). 2002 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

Chapter 1: Introduction

The Department of Pesticide Regulation (DPR) conducted a survey of all public school districts in California in April 2004. The purpose of the survey was to: (1) measure compliance with requirements of the Healthy Schools Act (HSA); (2) measure adoption of integrated pest management (IPM) policies, programs, and practices; (3) identify barriers to IPM adoption; (4) examine changes over time relative to prior surveys conducted in 2001 and 2002; and (5) relate demographic and geographic factors to survey responses. In addition, survey results and analyses will be used to guide future IPM training efforts conducted by DPR.

The HSA (enacted in January of 2001) aims to reduce exposure of children to pesticides in schools through the voluntary adoption of IPM and least-toxic methods of pest control. The law defines IPM as a means of preventing and suppressing pest problems using a combination of monitoring and record keeping, establishing pest thresholds, and non-chemical methods of pest management. Chemical controls that pose the least possible hazard to human health and the environment are used only after careful monitoring and pre-established thresholds and treatments indicate their use is necessary.

The law requires school districts to:

- Keep a registry of parents and guardians interested in notification of pesticide applications;
- Notify parents and guardians of specific pesticides applied in schools;
- Post signs on school grounds if pesticides are applied; and
- Keep records of pesticide applications for four years.

The DPR is required by the HSA to provide training to school district staff to facilitate the adoption of effective IPM programs and practices at school sites. This training effort began with a pilot workshop in June 2002, followed by nine additional workshops held through June 2004. A total of 232 school districts had been trained prior to completion of the 2004 SIPM survey.

The 2001 survey, which preceded initiation of DPR's training, served as a baseline for all subsequent surveys (Tootelian 2001).[i] Analysis of survey responses aided DPR's IPM training efforts and led to improvements in the 2002 survey (Geiger and Tootelian, 2003).[ii] The 2004 survey was modified further for clarity and to collect additional information. This report describes the 2004 survey results and findings of statistical analyses performed by scientists from the Institute for Social Research at California State University, Sacramento.

[ii] Tootelian, D.H. (2001). 2001 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[ii] Geiger, C.A. and D.H. Tootelian (2003). 2002 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

Chapter 2: Methodology

Data Collection

Following passage of the HSA in 2000, the Pest Management and Planning Program of the DPR offered training in IPM practices and initiated a survey to track IPM policies and practices in California school districts. Surveys of California's elementary, high school and unified school districts have been completed in 2001, 2002 and 2004. In April 2004, the California State University, Sacramento Institute for Social Research (ISR) mailed a total of 972 questionnaires to IPM coordinators identified in DPR's database, representing virtually all school districts in California. Follow-up mailings via e-mail and regular mail occurred in July and August respectively to improve the survey's response rate. (See Appendix 1.) The training database was later paired with California Department of Education (CDE) information on the demographic and enrollment characteristics of California school districts for use in the analysis.

Questionnaire. The survey's purpose is to measure the progress in compliance with HSA requirements and in the voluntary adoption of IPM in schools. The survey focuses on the control of ants and weeds because, in prior years, these were the most widely reported pest problems in California schools.

The 2004 survey was divided into four sections:

- General Pest Management Practices
- Ant Management Inside School Buildings
- Weed Management
- Respondent Information

The first section, General Pest Management Practices, determined the frequency of inquiries from the community concerning pest management issues, the types of pest control contracts entered into by the school district, the adoption of IPM policies or an IPM program, compliance with HSA requirements, the districts' recordkeeping and pest monitoring/detection activities, the respondent's assessment of the IPM program's effectiveness and cost, and the significance of eight possible barriers to using IPM practices in a school district.

The next two sections focus on ant and weed management since these are common pest problems for many California schools. The second section, Ant Management Inside School Buildings, determined whether a district did anything to manage ants *inside* school buildings within the last 12 months and, if yes, identified which specific practices were used and sought an evaluation of their estimated effectiveness. Respondents were also asked to describe how their district decided when treatment was necessary and which one practice they used most frequently.

The third section, Weed Management, asked whether a district did anything to manage weeds within the last 12 months identified which specific practices were used and sought an evaluation of their estimated effectiveness. Respondents were also asked to describe how their district decided when either broadcast or spot treatment with herbicides was necessary and which one practice they used most frequently to manage weeds in athletic fields and playgrounds. Finally, respondents were asked to indicate the location where their district typically had the most trouble with weeds.

The last section, Respondent Information, determined the respondents' pest management responsibilities and, if they were the IPM coordinator for their district, the length of time they had served in this capacity. Respondents were asked to rate their district on aspects of its pest management (question 23) and to describe their awareness and use of information resources on pest management in schools (question 24).

To determine what job categories were assigned specific pest management responsibilities, respondents were asked to write in their job title. Responses to this request typically included two pieces of information: the area in which a respondent worked (administration, front office/business, safety/risk management, or maintenance and operations) and their job level (administrator, director/coordinator, manager/supervisor, worker). These two aspects of respondent's jobs were coded separately and then combined into a single job category variable. Appendix Table 2.1 shows the joint distribution of the sample on the separately coded variables while Table 2.5 shows the distribution on the two combined. Respondents who worked in the business offices were grouped together, irrespective of job level; similarly, those working in safety or risk management were grouped independently of job level. Within maintenance and operations, job level distinctions were maintained.

The 2004 survey retained seven questions from the 2001 and 2002 surveys (questions 1, 4, 10, 13, 14, 15 and 19), and seven introduced in 2002 (questions 2, 3, 5, 6, 7, 23 and 24). Questions 9, 11, 12, 16, 17 and 18 were revised and/or reformatted questions from the earlier surveys, while questions 8, 20, 21 and 22, describing the respondent's role as designated IPM coordinator, were new. (See Appendix 1 for a copy of the questionnaire)

Summary measures. To more efficiently understand school districts' general IPM policies and practices, their degree of compliance with HSA requirements, and the degree to which they follow IPM ant and weed practices, four scales were constructed that summarized responses to sets of individual questions. Scale construction details for each of these are described in Chapter 3. The HSA compliance scale summarizes responses to four parts of question 3 (questions 3d through g). The IPM program scale summarizes responses to questions 3a, 3c and parts 1 through 6 of question 4. The ant management scale summarizes responses to 15 items contained in three survey questions (questions 10, 12, and 13), while the weed management scale summarizes responses to 11 items in three questions (questions 15, 17 and 18).

School district variables. It seemed reasonable to test whether compliance with the HSA and adoption of the IPM practices would be related to the geographic location, population size, and other characteristics of California school districts, such as the type of pests found in buildings and landscapingacross California's diverse ecosystems. Some school districts may not have ant problems due to the nature of the environment in which they are located, while others may not be troubled by weeds. Pressure to comply with the HSA may be greater in elementary school districts where children commonly play outside. High school students typically spend less time outside. Understanding factors that contribute to the variability in HSA compliance and adoption of IPM practices can assist DPR in prioritizing training workshop locations and adjusting workshop topics covered to the needs of particular types of districts.

Seven school district characteristics were considered. Six were obtained from the CDE for use in the analysis.[1] These included:

- A description of the population area in which the district is located
- The region (see Figure 2.1)
- District type (elementary, high school or unified)
- Number of schools in the district (from two to 20 or more)
- Average daily attendance (ADA, ranging from under 200 to 10,000 or more)
- Cost per ADA (ranging from under $6,000 to $10,000 or more).

The CDE classifies each school within a district relative to eight population area categories. This information is obtained from the U.S. Census Bureau. Some districts contain schools in more than one population area category. Of these “multiple area” districts, a majority (141 districts) have more than 75% of their schools concentrated in one type of area. For this study, a modified version of this variable was created so that these “multiple area” districts can be described in terms of the majority of schools in a given district. Districts were assigned the population area category in which more than 50% of its schools are located. For districts with schools evenly distributed across two or three types of areas, precedence was given to the larger or more urban area. Two of the eight area categories (large towns and small towns) were combined into one category. The resulting population area variable has seven categories:

Urban categories include:

1) Large city: an incorporated city with a population greater than or equal to 250,000.
2) Urban fringes of a large city: urban areas within a Consolidated Metropolitan Statistical Area (CMSA) or Metropolitan Statistical Area (MSA).

[1] The CDE maintains a downloadable file called PUBSCHLS.DBF which contains a list of California public schools and districts (www.cde.ca.gov/ds/si/ds/fspubschls.asp). The file also includes basic information about the schools and districts. Four variables from the 2002/2003 file were used for this study: 1) the location of a school relative to categories of populous areas; 2) county, which was used to construct regions within the state; 3) district type; and 4) the number of schools in a district. Enrollment data for 2002/2003 was obtained from another online CDE resource called DataQuest (data1.cde.ca.gov/dataquest/). Data regarding the two remaining district char-acteristics used in this study (ADA and cost per ADA for 2002/2003) were obtained from another online CDE resource (www.cde.ca.gov/ds/fd/ec/).

Figure 2.1. Map of Counties Included in School IPM Survey Regions

3) Mid-sized city: the central city of a CMSA or MSA with a population less than 250,000, but greater than 25,000.
4) Urban fringes of a mid-sized city: urban areas within a CMSA or MSA.
5) Small or large towns: incorporated places with a population greater than 2,500 (small towns) or 25,000 (large towns) located outside a CMSA or MSA.

Rural categories include:

6) Rural, inside MSA: any area within the CMSA or MSA of a large or mid-sized city and defined as rural by the Census Bureau. This includes farmland and towns of less than 2,500.
7) Rural, outside MSA: any area outside a CMSA or MSA and defined as rural by the Census Bureau.

Urban school districts might be expected to be more involved in IPM due to their greater visibility and the more formalized bureaucracy in large school districts. Small town and rural districts may lack the diversity of funding sources available to large urban districts—with multiple programs for children with special needs—and may have higher overhead costs per child, leaving them with fewer resources for school IPM and adoption of IPM practices. It is, therefore, important to include not only region and population size, but also the district type, number of schools and students in the district, ADA, and costs per ADA as variables that may be related to the adoption of IPM practices.

A seventh variable, whether anyone in the district had received IPM training offered by DPR, was obtained from DPR's database. School districts that had participated in the training would be expected to be more committed to adopting an IPM program, following the IPM practices and complying with the requirements of the HSA.

Response rates. A solid majority (55%) of California's 972 schools districts completed the survey on IPM policies and practices (Table 2.1). Response rates were higher in urban areas, including the urban fringes of large cities (57% to 64%), and lower in rural areas and the urban fringes of mid-sized cities (44% to 54%). Response rates were highest in the Los Angeles area and the South Eastern region and, despite its largely rural character, the North Coastal region (62% to 66%).

Elementary school districts had the lowest response rates (49%) among district types, while unified districts had the highest (62%). High school districts were about average (56%). Response rates increased regularly with the number of schools in the district, from a low of 45% for districts with only two schools to a high of 71% for districts with 20 or more schools. Response rates also increased with average daily attendance (ADA), although, with more size categories, the relationship is not as linear. School districts that spent less per ADA had higher response rates than those that spent more.

Finally, as expected, response rates were higher in districts that had received DPR's IPM training (65%) than they were in districts that had not (51%).

Representativeness of the sample. Survey respondents constitute a sample that is intended to represent the population of all California school districts in terms of their demographic characteristics, pest management policies and practices, and level of compliance with the HSA. If the sample closely mirrors the population's demographic characteristics, it is assumed that it would accurately reflect the population's pest management policies and practices and level of compliance with HSA. If the sample differs from the population's known characteristics (population area, region, district type, number of schools in district, ADA and cost per ADA), it is assumed that the sample's pest management behaviors will differ accordingly—if the demographic variables on which they differ are significantly related to these behaviors.

Despite the variability in response rates, responding districts closely resembled the population of school districts in California. Rural districts are only slightly under represented in the sample (31% vs. 35% of the population) and the urban fringes of large cities only slightly over represented (36% vs. 33%) (Table 2.2). The Central Valley region is slightly under represented (19% vs. 22%), while the Los Angeles basin is slightly over represented (23% vs. 20%). Elementary school districts are under represented (53% vs. 58% of the population), while unified school districts are over represented (38% vs. 33%).

The sample contains more respondents from larger school districts (15% with 20 or more schools vs. 11% of the population) and fewer from the smaller school districts (19% with only two schools vs. 24% of the population). A little more than a third of the sample (37%) has an average ADA of less than a thousand, compared with 43% of the population of school districts, while 20% of the sample represents districts with more than 10,000 ADA, compared with 16% of the population.

In spite of the over representation of larger and more urban, unified school districts, the sample is very similar to the population in terms of cost per ADA, differing by two percentage points or less from the population's distribution across cost categories.

When chi square goodness of fit tests are applied to the difference between sample and population characteristics, the sample differs significantly from the population on three variables: size, receipt of IPM training, and district type. School districts with more schools and higher ADA, unified districts, and those that have participated in the training workshops are over represented in the sample. *If* larger, unified or IPM-trained school districts are, for example, more compliant with HSA requirements and *if* they utilize better pest management practices than smaller or elementary districts that have not been trained, the sample will overstate these behaviors for the population as a whole.

Whether this overstatement is substantively important is a matter of judgment. Chi square is notably sensitive to sample size; in a large sample of 527 districts, differences of 4 to 5 percentage points are statistically significant. The importance of these differences depends upon the research goals. If the focus is on understanding what types of districts have complied with the HSA, have adopted an IPM program and IPM policies and practices, and follow IPM ant and weed management procedures, then slightly overstating the incidence of these behaviors is probably not important. If, instead, it is important to precisely predict what percentage of school districts comply with the HSA and have adopted these policies and practices, then the data could be weighted so that responses from responding districts reflect the same distribution of district characteristics as the population.

With the focus on understanding rather than predicting, it is enough to remember the nature of the bias in responding districts so that this can be taken into account in understanding the results.

Data Analysis

Outline of the analysis. The data collected in the 2004 survey of California school districts were analyzed in five stages. First, the responding school districts are described, one variable at a time, in terms of their percentage distribution on the seven district characteristics and five respondent characteristics. This stage is discussed in the sample description section of this chapter. A univariate description of the districts' IPM practices and their summary measures—the dependent variables—will follow in Chapter 3, using both percentages and means and standard deviations as appropriate. Third, the inter-relationships between district and respondent characteristics will be explored in Chapter 4 before considering them for entry in Chapter 5 into multivariate models that predict IPM policies and practices, the fourth stage in the analysis of 2004 data. Finally, Chapter 6 will address changes over time in district responses to questions common to three separate surveys of school districts' IPM policies and practices. This trend analysis compares percentage distributions on individual variables for either a two- or three-year period, utilizing survey data from 2001, 2002 and 2004. Throughout the analysis, major findings are highlighted in the chapters, while supporting findings appear in the appendices.

Statistical measures used in the analysis. In addition to descriptive statistics (percentages, means, standard deviations), the analysis employs two measures of association (chi square and Pearson's correlation coefficients), a measure of difference between the means on a dependent variable for each category of an independent variable (Analysis of Variance) and two types of regression (linear and logistic) to understand variable relationships in the data. All of the analysis was conducted using Statistical Packages for the Social Sciences (SPSS). Appendix Table 2.1 shows the SPSS procedure syntax for each type of test used in the analysis. The following provides a brief description of each measure and how it was used.

Chi square measures the association between two categorical variables. In only one instance–the evaluation of the representativeness of the sample–chi square goodness of fit is used to test the difference between the sample and the school district population on district characteristics. However, for all other analyses involving chi square presented in this report, chi square is used to test for independence in the distribution of two variables.

Pearson's correlation measures the relationship between two interval variables (for example, ADA and cost per ADA). Analysis of Variance (ANOVA) measures whether the means of an interval variable vary significantly between the values of a categorical variable (for example, whether means on the ant management scale vary between districts that have received IPM training and those that haven't).

Linear regression uses a least squares method to measure the relative contributions of a series of interval and categorical independent variables to an interval dependent variable (e.g., scores on the ant or weed management scales). Regression coefficients are selected that result in the smallest sums of squared distances between the observed and predicted values of the dependent variable.

Tables summarizing linear regression analysis results show the Adjusted R square for the model and the standardized coefficient for each variable included in the model. The adjusted R square is reported because it takes into account the number of variables in the model and the number of observations the model is based on. This allows for models with different numbers of variables to be compared.

Similarly, standardized coefficients are reported so that the relative strength of independent variables measured on different scales can be compared. The unstandardized coefficient shows the estimated change in the dependent variable for a one-unit change in the independent variable, holding all other independent variables constant. The standardized coefficient shows the normalized change in the dependent variable for a one standard deviation change in the independent variable. This has the effect of measuring the independent variables on the same scale, with a mean of 0 and a standard deviation of 1. In this standardized framework, there is no constant.

The analysis includes several categorical independent and dependent variables. A set of "dummy" variables was created so that these variables can be mathematically treated as interval variables for correlations and in linear and logistic regressions. Each dummy variable has a value of 0 (not in the specified category) or 1 (in the specified category). Tables that use these dummy variables show the labels for the category with a value of 1. A reference category for each categorical variable is omitted from the regression models and noted in a footnote to the table. All significant differences involving other values of that variable are with respect to the reference category.

Logistic regression measures the relative contributions of a series of interval and categorical independent variables to a categorical dependent variable (e.g., the adoption of an IPM program or not). In logistic regression, variables are selected using the maximum-likelihood method. Coefficients are selected that make the observed results most likely. Interpreting coefficients in logistic regression is not as straightforward as it is for linear regression. Since the coefficients are standardized, their relative size and their associated significance level indicate which variables are most important in predicting the dependent variable. But their contribution to a dichotomous dependent variable indicating the presence or absence of a characteristic cannot be described by the degree of change in such a variable. Instead, the increase in the odds of an outcome attributed to a given independent variable is used to describe the relative contribution of each independent variable in the model. This increase in the odds is summarized in the Exp(B) column of a table.

Models in the current study are being used to understand the importance of relationships between a set of independent variables and the dependent variable, rather than used to predict the probability that a given type of district would, for example, have adopted an IPM program. Therefore, the measures of interest are the size and direction of the coefficients (B), their associated significance levels, and the increase in the odds when there is a one-unit increase in the independent variable (Exp(B).

The Nagelkerke R square statistic is similar in intent to R square in linear regression. It is recommended as an improvement on Cox and Snell because a value of 1 can be achieved. It can be interpreted as the proportion of variation in the outcome variable that is explained by the logistic regression model. These values are typically smaller than the R square in linear regression.

The likelihood ratio chi square is used to determine whether a given variable improves the R square sufficiently that it should be included in the model.

Model construction. The linear and logistic regression models presented in this report were created using an iterative process in which the various combinations of independent variables were systematically entered and evaluated for their effect on the model. The model chosen is one that maximizes the proportion of explained variability in the dependent with the fewest number of independent variables. In Chapter 5, only the final model is shown for each dependent variable. Selected test models that provide information not included in the final models can be seen in the Appendix. Since the inclusion in a model of several highly correlated independent variables makes it difficult to identify their separate effects, the choice of which independent variables to include was informed by correlation matrices between independent variables, which are summarized in Appendix Tables 4.10-4.14.

Because of the need to be mindful of the relationships between independent variables, as well as a number of independent dummy variable sets which had to be "forced" into the model as a group, the SPSS model-building procedures (forward variable selection, backward elimination, and stepwise variable selection) were not used for this analysis.

Although research on people and their institutions cannot generally utilize an experimental design that makes it possible to identify cause and effect relationships between variables, social scientists make use of statistical modeling to understand these relationships and identify the more important independent or "causal" variables that are related to variability in a given dependent variable (the "effect"). These models are useful to policy makers because they suggest points of entry for influencing the outcome variable. The models are "suggestive," not definitive because all of the possible independent variables that might influence a dependent variable are usually not measured in a descriptive study and, lacking random assignment, they are not controlled by an experimental design.

Surveys of a defined population—in this case, school districts—are descriptive in nature because the districts are not randomly assigned to experimental and control groups, and they are not measured prior to the introduction of an independent variable in the experimental group, and again after its introduction. In other words, school districts cannot be randomly given a particular cost per ADA, or assigned an average ADA, or randomly required to attend IPM training. Instead, many of these variables are linked. Urban districts are larger in terms of number of schools and students, while rural schools are smaller on both variables. In this study, statistical models try to separate mathematically the independent contributions of population, region, district type, size and cost per ADA to variations in dependent variables of interest to DPR. These dependent variables include:

- Compliance with the requirements of the HSA
- Adoption of IPM policies and pest monitoring and recordkeeping practices
- Adoption of an IPM program
- Ant management practices
- Weed management practices

Two other variables serve as both independent and dependent variables in the analysis:

- Specific barriers to using IPM practices
- Pest management information resource awareness and use

These "intervening" variables may be affected by the school district variables and may, in turn, have an influence on the dependent or outcome variables. First, models will be created that attempt to explain variability in the specific barriers to using IPM practices and in awareness and use of IPM resources, using the seven school district variables as independent variables in the analysis. Then, the specific barriers and level of awareness and use of IPM resources will be added as independent variables to models explaining the five dependent variables.

Sample Description

District characteristics. The unit of analysis in this study is the school district. The results do not refer to the number of students affected by IPM policies and practices because districts vary widely in the number of students enrolled. Respondents are speaking on behalf of the district, describing their understanding of the district's IPM policies and practices.

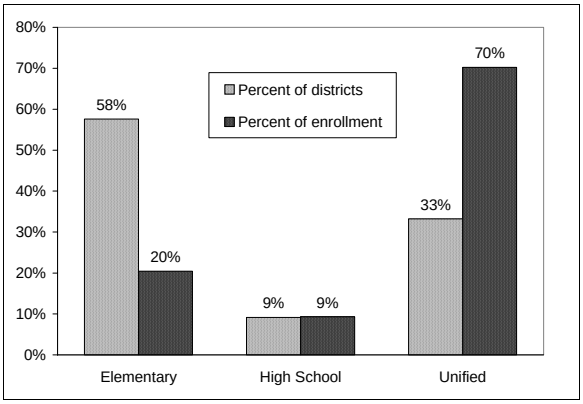
Forty percent of the 527 respondents represented school districts in large cities or their urban fringe, with another 22% representing districts in mid-sized cities and their urban fringes (Table 2.2). The remaining 38% of respondents came from rural areas and towns. A third of the respondents were from districts in the Los Angeles area and other urban counties in the southern part of the state. The valley (Central and North Central) and coastal areas (including the Bay Area, Central Coast and the North Coast) each comprised a little over a fourth of the respondents (27% each). Districts in the Sierra region accounted for 13% of all respondents.

A majority of respondents (53%) were from elementary school districts while almost four in ten (38%) represented unified school districts. Nearly two-thirds (63%) represented districts with nine or fewer schools with over half of these (34%) concentrated in districts with two to four schools. The distribution of ADA was bimodal: ADA was under a thousand in roughly a third (37%) of the respondents' districts and 5,000 or more in another third (35%). The smaller group in the middle (28%) had ADAs between 1,000 and 4,999. Roughly two-thirds (64%) of the respondents came from districts with lower costs per ADA (under $7,000). Finally, 28% of responding districts had attended DPR's IPM training.

The importance of distinguishing school districts and students can be seen in the relationship between the type of district and the percent of statewide student enrollment. Elementary school districts make up

58% of all school districts in the state, but account for only 20% of student enrollment. Conversely, unified school districts constitute a third of all districts, but account for 70% of student enrollment. High school districts alone are balanced, accounting for 9% of each. (Figure 2.2)

Figure 2.2 For All California Public School Districts: A Comparison of the Percent of Districts and Percent of Enrollment in the Different Types of Districts



A more important example might be the relationship between enrollment and DPR's IPM training. Although 24% of all California public school districts had attended training by June 30, 2004, these districts include 52% of all statewide students (Table 2.3). DPR has clearly focused on training districts with the largest enrollments. In selecting the next group of school districts, DPR may also want to concentrate on districts with the largest number of elementary school children due to the increased exposure and vulnerability among younger students. These will include both elementary school districts and unified districts with large elementary populations. Elementary school children are more apt than high school students to play outside and are therefore more apt to be exposed to chemicals that may have been used in that environment.

Respondent characteristics. Most of the respondents (84%) served as the designated IPM coordinator for their district (Table 2.4). A third had been the IPM coordinator for 1 to 2 years, while another third had served in this capacity for 3 to 4 years. The remaining third were equally split between a tenure of less than a year or more than 5 years as IPM coordinator. The most common pest management responsibilities assumed by the respondents included:

- Directing others to apply pest management treatments (69%)
- Keeping records of all pest management treatments used (67%)
- Deciding when to apply pest management treatments (65%)
- Deciding which pest management practices to use (64%)
- Pest management and pesticide safety training (61%)

Respondents were less involved in setting pest management policies (47%) or applying pest management treatments (32%).

Typically, the respondents were either director/coordinators or manager/supervisors of Maintenance and Operations (61%, see Table 2.5). Another 14% served in administrative positions, while 13% in worked in business or safety/risk management positions. Only 12% of the respondents were Maintenance and Operations workers.

Table 2.1. Response Rates by Seven District Characteristics

		Number of districts that were mailed the survey	Number of districts that completed the survey[1]	Response Rate
Overall		972	533	55%
Population area	Large city	36	22	61%
	Urban fringes of large city	322	189	59%
	Mid-size city	91	52	57%
	Urban fringes of mid-size city	128	62	48%
	Large or small town	59	38	64%
	Rural, inside MSA	180	79	44%
	Rural, outside MSA	156	85	54%
Region	North Coastal	63	41	65%
	Sierra	129	68	53%
	North Central	83	41	49%
	Bay Area	160	76	48%
	Central Valley	211	102	48%
	Central Coastal	55	28	51%
	LA/Surrounding Area	192	119	62%
	South Eastern	79	52	66%
District type	Elementary	560	277	49%
	High School	89	50	56%
	Unified	323	200	62%
Number of schools in district	2	229	102	45%
	3-4	168	78	46%
	5-9	274	151	55%
	10-19	191	118	62%
	20 or more	110	78	71%
Average daily attendance (ADA)	Under 200	177	85	48%
	200-499	123	53	43%
	500-999	113	60	53%
	1,000-1,999	107	49	46%
	2,000-2,999	81	41	51%
	3,000-4,999	93	56	60%
	5,000-9,999	127	77	61%
	10,000 or more	151	106	70%
Cost per ADA	Under $6,000	100	63	63%
	$6,000-$6,499	243	132	54%
	$6,500-$6,999	255	140	55%
	$7,000-$7,999	184	100	54%
	$8,000-$9,999	93	44	47%
	$10,000 or more	97	48	49%
Attended DPR IPM training by June 30, 2004	Yes	232	150	65%
	No	740	377	51%

[1] Six completed surveys were returned with the district identification numbers removed. This prevented the matching of these responses with the district characteristics obtained from the California Department of Education and the Department of Pesticide Regulation. These surveys were included in the dataset for this study but could not be included in analysis involving one or more of these district characteristics.

Table 2.2 District Characteristics for All Districts and for Responding Districts

		All districts that were mailed the survey		Districts that completed the survey		
		Percent	*Number*	Percent	*Number*	p^1
Population area	Large city	4%	*36*	4%	*22*	.311
	Urban fringes of large city	33%	*322*	36%	*189*	
	Mid-size city	9%	*91*	10%	*52*	
	Urban fringes of mid-size city	13%	*128*	12%	*62*	
	Large or small town	6%	*59*	7%	*38*	
	Rural, inside MSA	19%	*180*	15%	*79*	
	Rural, outside MSA	16%	*156*	16%	*85*	
	Total	100%	*972*	100%	*527*	
Region	North Coastal	6%	*63*	8%	*41*	.278
	Sierra	13%	*129*	13%	*68*	
	North Central	9%	*83*	8%	*41*	
	Bay Area	16%	*160*	14%	*76*	
	Central Valley	22%	*211*	19%	*102*	
	Central Coastal	6%	*55*	5%	*28*	
	LA/Surrounding Area	20%	*192*	23%	*119*	
	South Eastern	8%	*79*	10%	*52*	
	Total	100%	*972*	100%	*527*	
District type	Elementary	58%	*560*	53%	*277*	.052
	High School	9%	*89*	9%	*50*	
	Unified	33%	*323*	38%	*200*	
	Total	100%	*972*	100%	*527*	
Number of schools in district	2	24%	*229*	19%	*102*	.009
	3-4	17%	*168*	15%	*78*	
	5-9	28%	*274*	29%	*151*	
	10-19	20%	*191*	22%	*118*	
	20 or more	11%	*110*	15%	*78*	
	Total	100%	*972*	100%	*527*	
Average daily attendance (ADA)	Under 200	18%	*177*	16%	*85*	.045
	200-499	13%	*123*	10%	*53*	
	500-999	12%	*113*	11%	*60*	
	1,000-1,999	11%	*107*	9%	*49*	
	2,000-2,999	8%	*81*	8%	*41*	
	3,000-4,999	10%	*93*	11%	*56*	
	5,000-9,999	13%	*127*	15%	*77*	
	10,000 or more	16%	*151*	20%	*106*	
	Total	100%	*972*	100%	*527*	
Cost per ADA	Under $6,000	10%	*100*	12%	*63*	.752
	$6,000-$6,499	25%	*243*	25%	*132*	
	$6,500-$6,999	26%	*255*	27%	*140*	
	$7,000-$7,999	19%	*184*	19%	*100*	
	$8,000-$9,999	10%	*93*	8%	*44*	
	$10,000 or more	10%	*97*	9%	*48*	
	Total	100%	*972*	100%	*527*	
Attended DPR IPM training by June 30, 2004[2]	Yes	24%	*232*	28%	*150*	.013
	No	76%	*740*	72%	*377*	
	Total	100%	*972*	100%	*527*	

[1] Significance of chi square goodness-of-fit test. Probabilities ≤ .05 are boxed for easy identification.

[2] Of the 150 responding districts who had attended training by the end of June 2004, 63 districts had attended training during 2002 or 2003.

Table 2.3 Percent and Number of Students Enrolled in All California Public School Districts by District Type and DPR IPM Training

	Had district attended DPR IPM training by June 2004?	Elementary	High School	Unified	Total
Percent of students	Yes	37%	31%	59%	52%
	No	63%	69%	41%	48%
	Total	100%	100%	100%	100%
Number of students	Yes	457,242	174,429	2,544,036	3,175,707
	No	789,243	394,028	1,736,344	2,919,615
	Total	1,246,485	568,457	4,280,380	6,095,322

Table 2.4 Respondent Responsibilities

		Percent	*Number of cases*
Designated IPM coordinator for district	Yes	84%	*439*
	No	16%	*85*
	Total	100%	*524*
For designated IPM coordinators, length of time with this responsibility	Less than 1 year	16%	*68*
	1-2 years	34%	*150*
	3-4 years	34%	*147*
	5-10 years	9%	*39*
	More than 10 years	7%	*31*
	Total	100%	*435*
Pest management responsibilities	Pest management and pesticide safety training	61%	*317*
	Setting pest management policies	47%	*245*
	Deciding when to apply pest management treatments	65%	*337*
	Deciding which pest management practices to use	64%	*331*
	Applying pest management treatments	32%	*165*
	Directing others to apply pest management treatments	69%	*358*
	Keeping records of all pest management treatments used	67%	*348*
	Other	3%	*15*
	Total	n/a	*517*

Table 2.5 Respondent Job Category[1]

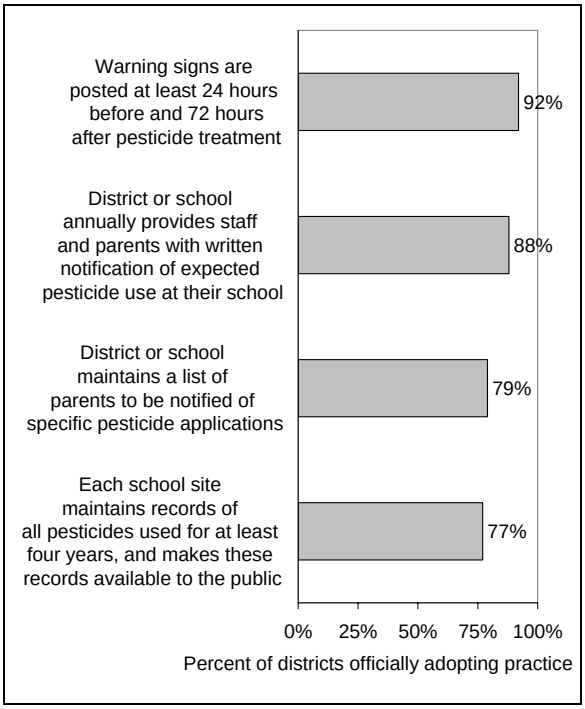
	Percent	*Number of cases*
Administration	14%	*70*
Front office/business	8%	*40*
Safety/risk management	5%	*22*
Maintenance & Operations Director/Coordinator	34%	*166*
Maintenance & Operations Manager/Supervisor	27%	*132*
Maintenance & Operations Worker	12%	*58*
Total	100%	*488*

[1] The survey form asked respondents to write in their job title. Respondents provided nearly 200 different job titles. In order to construct the variable described here, the individual job titles were categorized according to area and level. Appendix Table 2.1 shows the distribution of job area and job level. The Maintenance and Operations categories include respondents with job titles involving one or more of the following areas: Maintenance, Operations, Transportation, Grounds, Facilities, Custodial, Buildings, Bus Drivers or Pest Management.

Chapter 3: Summary of School District IPM Program Adoption, Policies and Practices

This chapter covers responses to individual questions on IPM policies and practices and indicates what practices were used to manage ants and weeds during the previous 12 months. It will describe the construction of four scales that summarize district variations in HSA compliance, IPM policies, pest monitoring and recordkeeping, and most specifically, ant and weed management practices. In addition, two other scales summarize IPM resource information awareness and use.

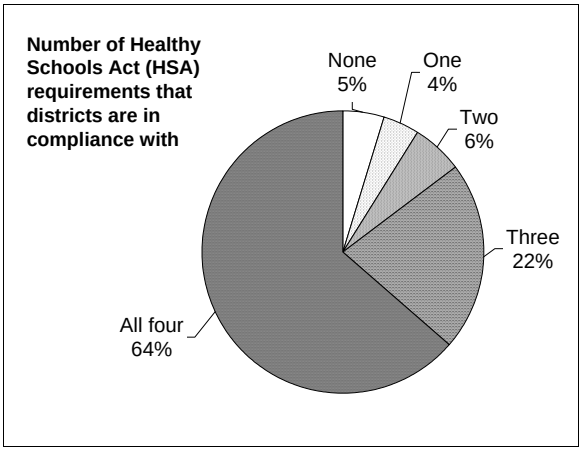
Figure 3.1 Percent of Districts Officially Adopting Practices Required for Compliance with the Healthy Schools Act



Individual IPM Policies and Practices

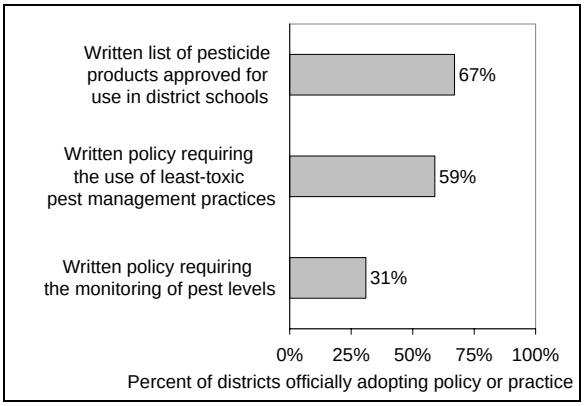
General IPM policies and practices. School districts are much more likely to comply with the requirements of the HSA than they are to adopt IPM-related policies or practices (Table 3.1). Moreover, some requirements of the act are adhered to more closely than others (Figure 3.1). Almost all school districts (92%) post warning signs before and after pesticide treatment and annually provide staff and parents with written notification of expected pesticide use at their school (88%). Roughly three-fourths maintain a list of parents to be notified of specific pesticide applications (79%) and maintain school site records of all pesticides used for at least four years (77%). Almost two-thirds (64%) comply with all four requirements (Figure 3.2).

Figure 3.2 District Compliance with the Healthy Schools Act



The percentages shown in Table 3.1 probably underestimate the degree of compliance with the HSA. Some respondents skipped Question 3, and wrote that that their district did not use any pesticides and that therefore the questions weren't applicable. An unknown number of other respondents may have simply answered “no” for the same reason, but without a written explanation.

Figure 3.3 Percent of Districts Officially Adopting Additional IPM Policies or Practices

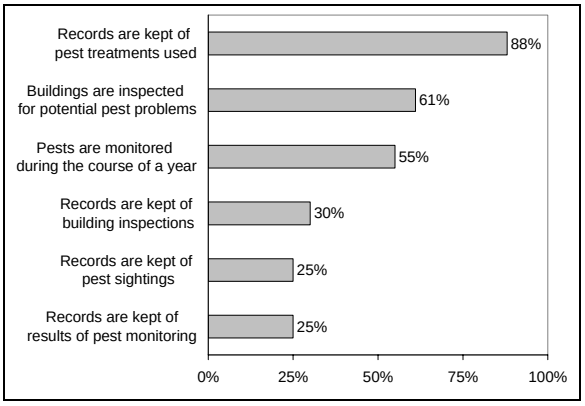


Of the three policies asked about in the questionnaire, districts were most apt to have a written list of pesticide products approved for use in district schools (67%, see Figure 3.3). A majority (59%) also had a written policy requiring use of the least-toxic pest management practices, while roughly a third (31%) required monitoring of pest levels. Respondents were less sure of their district's written policies (11% to 19% indicating “not sure”) than they were of the

district's adherence to requirements of the HSA (2% to 11% “not sure”).

Of the eight questions on recordkeeping and pest monitoring activities, districts were most apt to keep records of pest treatments used (88%), a requirement of the HSA (Figure 3.4 and Table 3.2). A majority of districts inspect buildings for potential pest problems (61%) or monitor pests during the course of a year (55%). Keeping records of building inspections, pest sightings and the results of pest monitoring are less common activities (30%, 25% and 25% respectively).

Figure 3.4 Percent of Districts Keeping Records and Monitoring Pests



By April 2004, two-thirds (69%) of all school districts had adopted an IPM program (Table 3.3). The real figure is probably higher because 75% of respondents who were in the best position to know—the IPM coordinators—said that their district had adopted this type of program. Respondents who were not IPM coordinators were less sure about the existence of an IPM program in their district (28% vs. 10% unsure among IPM coordinators, see Appendix Table 3.1).

A majority (60%) of the districts with an IPM program adopted it two or three years ago in 2001 or 2002 (Table 3.3). Most of the remaining districts (34%) had adopted an IPM program more than three years ago while only 6% introduced one within the past couple of years.

Districts that have adopted an IPM program were asked to evaluate the program’s impact on both the effectiveness and long-term cost of pest management. In general, perceptions regarding effectiveness are more consistently positive than perceptions regarding long-term cost (Table 3.4). Nearly half (49%) of all districts with an IPM program felt that the program has resulted in more effective pest management. One-third (33%) of districts with an IPM program feel that the program has reduced the long-term cost of pest management.

According to respondents, the major barriers to using IPM practices in their district identified as “very significant” were inadequate staffing (34%), budget restrictions (24%) and age and condition of school facilities (17%, see Table 3.5).

The nature of an IPM program varies across districts. Some features of these programs can be inferred from the policies and practices that distinguish districts that have one from those that don't. Table 3.6 provides information to examine the assumption that districts with an IPM program would have written policies and greater HSA compliance than districts lacking this program. Indeed, districts with an IPM program tend to have a written policy requiring use of the least-toxic pest management practices (73% vs. 26% for districts without such a program) and a written list of approved products (76% vs. 44% for districts lacking an IPM program). Although districts, with or without an IPM program, are less apt to have a written policy requiring the monitoring of pest levels, those with a program are four times as likely to have such a policy as those without (40% of those with an IPM program vs. 10% of those without).

Districts with an IPM program are more apt to maintain public records of all pesticides used for at least four years (85% vs. 61% in those without one), annually provide staff and parents with written notification of expected pesticide use at their school (95% vs. 70%), maintain a list of parents wanting to be notified of specific pesticide applications (89% vs. 58%), and post warning signs at least 24 hours before and 72 hours after pesticide treatment (97% vs. 80%).

In terms of practices, districts with an IPM program keep records of pest treatments used (95%), inspect buildings for potential pest problems (66%) and monitor pests during the course of a year (60%, see Table 3.7). Only a third of these districts keep records of building inspections (34%), pest sightings (31%) and the results of pest monitoring (30%). The dominance of recording pest treatments used reflects both its importance in an IPM program, but also its inclusion as a requirement in the HSA. Compliance with this portion of the HSA is actually lower (85%) because it is more restrictive—setting a 4-year minimum time period for keeping records and requiring that they be publicly available.

Coordinators are somewhat more aware than non-coordinators that specific policies had been adopted,

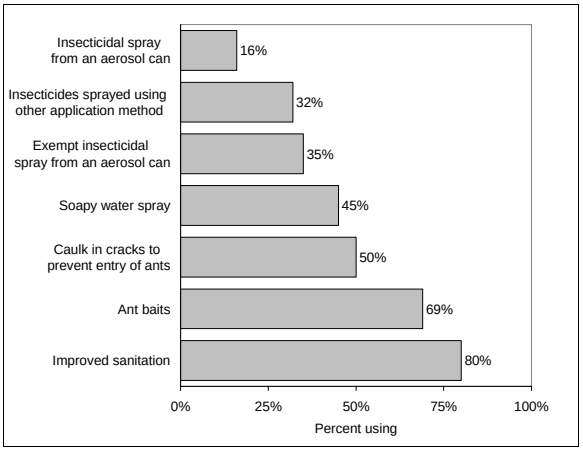
particularly those not associated with the HSA; non-coordinators, on the other hand, were much more likely to be unsure whether these specific policies had been adopted (Appendix Table 3.1).

Districts were asked whether they have contracts for four types of pest control: termite; food service area; perimeter; and grounds. Most districts (78%) reported having at least one type of contract with a pest control business (Table 3.8). Food service area and perimeter pest control were the most common types of contracts. Slightly more than half (55%) of districts have contracts for food service area pest control and just under half (48%) have contracts for perimeter pest control. Contracts for termite and grounds pest control were less common. Thirty-seven percent of districts contract for termite control and 31% of districts contract for grounds pest control.

Ant management practices. Most school districts (81%) did something to manage ants inside school buildings within the last 12 months (Table 3.9). This figure may understate the proportion because respondents in districts that routinely practice good sanitation may have given a "no" response to the question asking whether their district "did anything to manage ants inside school buildings."

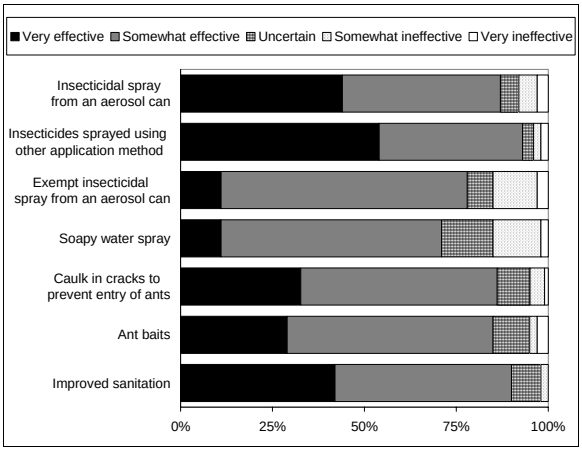
Other districts may be in locations where ants are not a problem or may have newer buildings where ants cannot easily gain access. Analysis of the distinguishing characteristics of districts that did and did not do something to manage ants indicates that large, urban districts and small rural districts both inside and outside an MSA are less likely to have done something to manage ants within the past year (Appendix Tables 3.2 and 3.3).

Figure 3.5 Practices Used to Manage Ants Inside School Buildings



The most common practices used to manage ants inside school buildings are improved sanitation (80%) and ant baits (69%, see Table 3.10 and Figure 3.5). Caulking and the use of soapy water spray are used by roughly half of the school districts (50% and 45% respectively). Roughly a third used exempt insecticide sprays from an aerosol can (35%) or insecticides sprayed using another application method (32%). Only 16% reported use of an insecticide spray from an aerosol can.

Figure 3.6 Effectiveness of Practices Used to Manage Ants Inside School Buildings



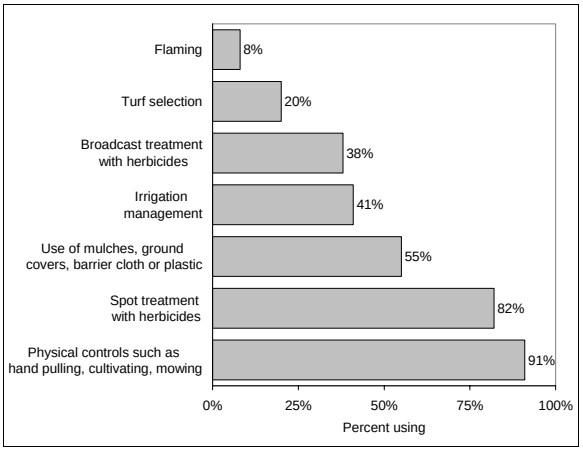
The difficulty is that the less IPM-compatible practices are seen as very effective; more respondents identified non-aerosol and aerosol insecticides as "very effective" than any other ant management practice (54% and 44% respectively, see Table 3.11 and Figure 3.6). Improved sanitation was a close third with 42% describing it as "very effective." Roughly a third define caulking and ant baits (33% and 29% respectively) as "very effective," putting them in the middle in terms of their perceived effectiveness, while exempt aerosol sprays and soapy water sprays are perceived as least effective.

Among the more IPM-compatible practices, improved sanitation is seen as more effective than ant baits, yet ant baits are the one practice used most frequently to manage ants (34%), while improved sanitation is a distant second (19%) and non-aerosol insecticides third (12%, see Tables 3.11 and 3.12). It is not surprising that exempt and soapy water sprays are rarely the most frequent method used because they are more often perceived as "somewhat or very ineffective." Caulking does not need to be done frequently to be effective while insecticidal sprays are burdened by notification requirements that alone may discourage their use.

Most ant management practices are employed when ants are first noticed (Table 3.13). Improved sanitation is one exception; slightly less than half of the school districts use it at regular time intervals (45%) while a similar percentage (43%) use it when ants are first noticed. Non-aerosol insecticide sprays are atypical in that roughly equal numbers of districts use the four possible decision rules in deciding when to use them: at regular time intervals (29%); when ants are first noticed (23%); when the number of ants exceeds a pre-established threshold (24%); and after a certain number of complaints (20%). Since this method is seen as the most effective, it seems that almost anything justifies its use.

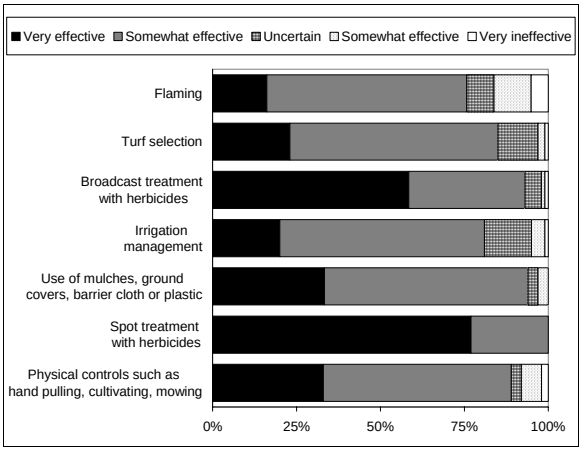
Weed management practices. Almost all (94%) school districts did something in the past year to manage weeds (Table 3.14). The most common practices used to manage weeds are physical controls such as hand pulling, cultivating and mowing (91%), spot treatment with herbicides (82%), and the use of mulches, ground covers, barrier cloth or plastic (55%, see Table 3.15 and Figure 3.7). Less than half of the districts used irrigation management (41%), broadcast treatment with herbicides (38%), and turf selection (20%).

Figure 3.7 Practices Used to Manage Weeds



Most respondents (77%) felt that spot treatment with herbicides was "very effective" (Table 3.16 and Figure 3.8). Broadcast treatment with herbicides had the second highest effectiveness rating, with 59% of respondents saying it was "very effective". None of the other weed management methods came close to these effectiveness ratings; between 16% and 33% of respondents rated the other methods as "very effective." Flaming was rated as somewhat or very ineffective by more respondents (16%) than any other method, while there was more uncertainty about the effectiveness of irrigation management and turf selection (14% and 12% respectively).

Figure 3.8 Effectiveness of Practices Used to Manage Weeds



Weeds are such a problem for school districts that a quarter of the respondents listed multiple areas when asked for the one location where they have the most trouble with weeds (Question 19, Appendix Table 1.13). Whether the data summary uses a single choice or allows multiple responses, fence rows and landscaping were the most common locations where districts had trouble with weeds (49% and 41% respectively when multiple responses are allowed) (see Table 3.17). Two locations of special concern to DPR—athletic fields and playgrounds—were mentioned by 20% and 11% of the respondents. These locations are ones where the most contact between students and pesticides could occur. The practices used most frequently to manage weeds in those locations were spot treatment with herbicides (40% for athletic fields and 48% for playgrounds) and physical controls (35% for athletic fields and 34% for playgrounds) (see Table 3.18). Broadcast treatment with herbicides on athletic fields was the only other practice mentioned by a significant number of respondents (14%). It appears that approximately a third of the districts are trying to depend upon a more IPM-compatible method even though that method—physical controls—is not perceived as "very effective" by a large proportion of the sample.

Herbicide treatment of weeds is typically used at regular time intervals, whether broadcast (71%) or spot treatments (42%) are employed (Table 3.19). Spot treatments, however, are also utilized when weeds are first noticed (30%) or when they exceed a pre-established threshold (25%).

IPM information resources. Respondents were asked whether they were aware of or had used specific IPM information resources. Most respondents (approximately 80%) were at least aware of, or had used, training workshops on school IPM, information provided by licensed pest control businesses, DPR's School IPM Web site and DPR brochures/handouts (Table 3.20). Usage rates were highest for DPR brochures (59%), DPR's School IPM Web site (58%), information provided by licensed pest control business (56%), and training workshops on school IPM (51%). Respondents were least familiar with the CDE, School Facilities Planning Division and the University of California resources (42% and 40% were not aware of these resources).

Scale Construction and Findings

Since it is difficult to describe relationships between district or respondent characteristics and variations in IPM policies and practices using the individual questions described above, four scales were constructed that summarize each district's degree of compliance with HSA requirements, the extent of their IPM-related policies and pest monitoring and recordkeeping activities, and the degree to which their ant and weed management practices adhere to key IPM principles. Two additional scales were constructed to summarize awareness and use levels for IPM information resources. This section describes the components of each scale and how they were combined and weighted to reflect the relative importance of various district policies and practices. Finally, average scores on each scale will be described for the sample as a whole. Relationships between district or respondent characteristics and the scales will be discussed in Chapter 5.

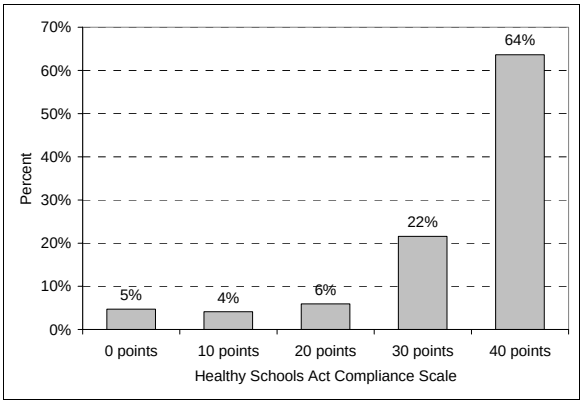
Healthy Schools Act compliance scale. The HSA Compliance scale summarizes four questions regarding whether a district has officially adopted four practices.[1] The 2000 law requires districts to incorporate these four practices in their management of pesticide use on school campuses. Responses to the four items are significantly and positively correlated with each other, which reinforces the earlier conclusion that similar adoption levels for the four practices suggest that districts are adopting the requirements as a package (see Appendix Table 3.4). Figure 3.9 shows the four practices and their assigned points.

Districts were assigned 10 points for each HSA requirement that they had adopted, yielding a range of 0 to 40 points for the scale. The distribution of districts on this scale is shown in Figure 3.10. Almost two-thirds (64%) of the school districts had complied with all four requirements of the Act, while another 22% had complied with three of the four. Only 5% of districts had failed to comply with any of the Act's requirements. The mean score for the sample was 33.5.

Figure 3.9 Practices and Assigned Points for Components of the Healthy Schools Act Compliance Scale

Each school site maintains records for all pesticides used for at least four years, and makes these records available to the public	10 points
District or school annually provides staff and parents with written notification of expected pesticide use at their school	10 points
District or school maintains a list of parents wanting to be notified of specific pesticide applications	10 points
Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	10 points
Total maximum score possible	40 points

Figure 3.10 Distribution of Scores on the Healthy Schools Act Compliance Scale



IPM program scale. Responses to eight questions comprise the IPM program scale.[2] All but one of the 28 pairs of items is significantly correlated. Monitoring pests during the course of a year (Question 4, item 3) is not significantly related to keeping records of pest treatments used (Question 4, item 6), as mandated by the HSA (see Appendix Table 3.5).

[1] Questions 3d, 3e, 3f and 3g (see Appendix 1).

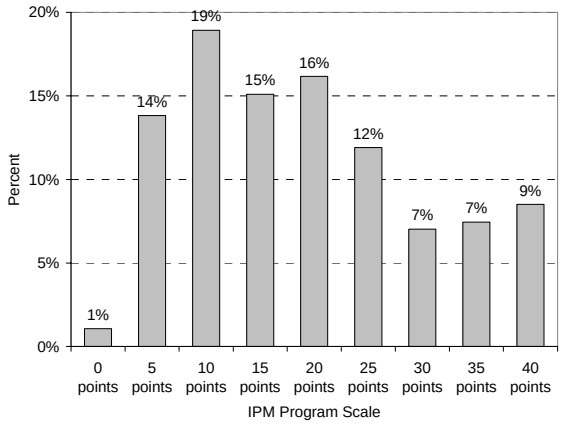
[2] Questions 3a and 3c and Question 4, items 1 through 6 (see Appendix 1).

Districts were assigned 5 points for Questions 3a and c and for each of the six items in Question 4, yielding a range of 0 to 40 points for this scale. The policies, monitoring and recordkeeping activities with their assigned points are shown in Figure 3.11. The distribution of districts on the scale is shown in Figure 3.12.

Figure 3.11 Practices and Assigned Points for Components of the IPM Program Scale

Policy	
Written policy requiring the use of least-toxic pest management practices	5 points
Written policy requiring the monitoring of pest levels	5 points
Monitoring	
Buildings are inspected for potential pest problems	5 points
Pests are monitored during the course of a year	5 points
Recordkeeping	
Records are kept of building inspections	5 points
Records are kept of results of pest monitoring	5 points
Records are kept of pest treatments	5 points
Records are kept of pest treatments used	5 points
Total maximum score possible	40 points

Figure 3.12 Distribution of Scores on the IPM Program Scale



Districts are much more dispersed on this scale because, with the exception of Question 4, item 6, these are voluntary rather than mandatory activities. Less than a fourth of the districts (23%) have 30 or more points on the IPM program scale. Half of the districts score between 10 and 20 points on these policy, monitoring and recordkeeping activities. The mean score for the sample on this scale was 19.2.

Ant management scale. The ant management scale measures the extent to which districts used IPM methods to manage ant problems inside school buildings. DPR staff developed the scale in cooperation with ISR. Scores on the ant management scale range from 0 to 148 points with a theoretical maximum of 153 points. Districts lost and gained scale points depending on whether their practices were consistent with IPM. To avoid negative values, all districts started the scoring process with 25 points. High scores indicate ant management practices are consistent with IPM principles.

The scale was constructed from responses to 15 items covered in three survey questions. Question 10 asked respondents to indicate which of seven practices they used to manage ants inside buildings. Districts could score up to 70 points on this portion of the scale. Question 12 asked respondents to indicate how their district decided when treatment with each of the seven practices was necessary. Districts could score from -35 to +43 points on this portion of the scale. Question 13 asked respondents which one practice they use most frequently to manage ants inside school buildings. Districts could score from -15 to +15 points on this portion of the scale. Table 3.21 shows the points allocated for each response.

In order to understand how the scale works, it is helpful to review the scoring process for a specific district. Two districts received a score of zero. Figure 3.13 shows how one of these district's practices were scored. In contrast, the highest scoring district received 148 points. Figure 3.14 shows how this district's practices were scored.

Figure 3.13 Scoring for a District with 0 Points on the Ant Management Scale

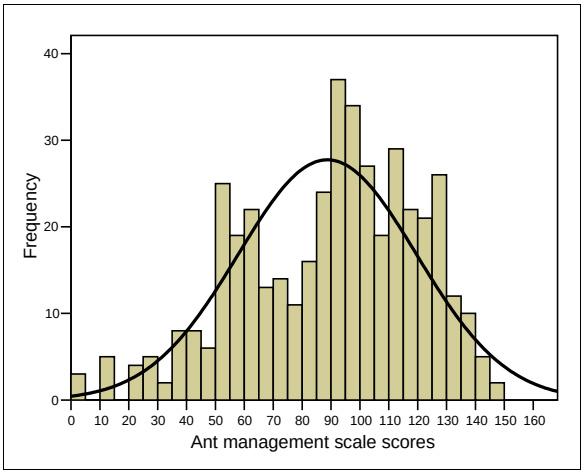
Starting score	+25 points
Used only insecticidal spray from an aerosol can and insecticides sprayed using other application methods	0 points
Used insecticidal spray from an aerosol can when ants are first noticed	-10 points
Used insecticides sprayed using other application methods when ants are first noticed	-5 points
Most frequently used practice was insecticides sprayed using other application methods	-10 points
Total score	0 points

Figure 3.14 Scoring for a District with 148 Points on the Ant Management Scale

Starting score	+25 points
Did not use insecticidal spray from an aerosol can	+15 points
Did not use insecticides sprayed using other application methods	+10 points
Used ant baits	+10 points
Used soapy water spray	+5 points
Used caulk in cracks	+15 points
Used improved sanitation	+15 points
Used ant baits when ants were first noticed	+3 points
Used soapy water spray when ants were first noticed	+5 points
Used caulk in cracks at regular time intervals	+15 points
Used improved sanitation at regular time intervals	+15 points
Most frequently used practice was improved sanitation	+15 points
Total score	148 points

Districts are widely dispersed on this scale, from a low of 0 to a high of 148 out of 153 possible points (Figure 3.15 and Appendix Table 3.6). School districts score on the high side in using more IPM-compatible ant management practices. The mean of 89 is pulled below the median of 93 by some extremely low scores that contrast with the large group of high-scoring districts, creating a sample that is negatively skewed (Table 3.23).

Figure 3.15 Distribution of Scores on the Ant Management Scale



Weed management scale. The weed management scale measures the extent to which districts used IPM methods to manage weed problems. DPR staff developed the scale in cooperation with ISR. Scores on the weed management scale range from 0 to 155 points out of a possible 160 points. Districts lost points for using practices not consistent with IPM and gained points for using practices consistent with IPM. To avoid negative values, all districts started the scoring process with 50 points. High scores indicate weed management practices are consistent with IPM principles.

The scale was constructed from responses to 11 items covered in three survey questions. Question 15 asked respondents to indicate which of seven practices they used to manage weeds. Districts could score up to 80 points on this portion of the scale. Question 17 asked respondents to indicate how their district decided when treatment with herbicides was necessary. Districts could lose up to 25 points on this portion of the scale. Question 18 asked respondents which practice they use most frequently to manage weeds in athletic fields and playgrounds. Districts could score from -35 to +30 points on this portion of the scale. Table 3.22 shows the points allocated for each response.

In order to understand how the scale works, it is helpful to review the scoring process for specific districts. Five districts received a score of zero on the weed management scale. Figure 3.16 shows how one of these district's practices were scored. In contrast, the highest scoring district received 155 points. Figure 3.17 shows how they were scored.

Figure 3.16 Scoring for a District with 0 Points on the Weed Management Scale

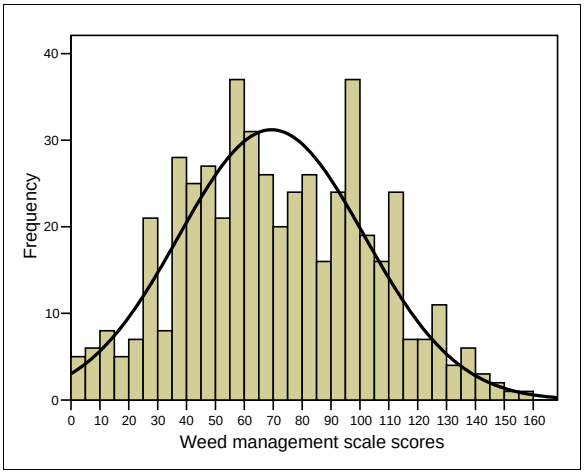
Starting score	+50 points
Used only broadcast treatment with herbicides and spot treatment with herbicides	0 points
Used broadcast treatment with herbicides at regular time intervals	-15 points
Used spot treatment with herbicides at regular time intervals	-10 points
Spot treatment with herbicides was the most frequently used practice for athletic fields	-10 points
Spot treatment with herbicides was the most frequently used practice for playgrounds	-15 points
Total score	0 points

Figure 3.17 Scoring for a District with 155 Points on the Weed Management Scale

Starting score	+50 points
Did not use broadcast treatment with herbicides	+10 points
Did not use spot treatment with herbicides	+5 points
Used mulches, ground covers, barrier cloth or plastic	+15 points
Used irrigation management	+15 points
Used turf selection	+15 points
Used physical controls such as hand pulling, cultivating, mowing	+10 points
Used flaming	+10 points
Turf selection was the most frequently used practice for athletic fields	+15 points
Physical controls such as hand pulling, cultivating and mowing were the most frequently used practice for playgrounds	+10 points
Total score	155 points

Districts are also widely dispersed on this scale, from a low of 0 to a high of 155 out of 160 possible points (Figure 3.18 and Appendix Table 3.7). The mean, 69.4, is lower because the scale is less complex and offers fewer variations in practices. The sample is more normally distributed on this scale, with a median of 67 and a mean of 69.4, but it is skewed in the opposite direction (Table 3.23). Slightly over half of the districts (50.7%) score lower than the mean while close to a third (29.4%) score between 90 and 130, creating the positive skew. In other words, although a significant group of districts are using more IPM-compatible weed management practices, the majority of districts are not using practices consistent with IPM.

Figure 3.18 Distribution of Scores on the Weed Management Scale



IPM information resource awareness and use scales. Respondents were asked whether they were aware of or had used each of eight information resources on IPM (Appendix 1, Question 24). Two scales were constructed: one that counted either awareness or use for each of the eight (the information resource awareness scale) and one that counted use only (the information resource use scale). Each scale varied from zero to eight.

Respondents were aware of 5.6 resources, on average, and had used 3.3. In other words, they were aware of more IPM information resources than they had used (Table 3.22).

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Table 3.1 Official Adoption of Policies and Practices

Has district officially adopted (through a school board action or administrator's directive) the following policies or practices?[1]		Yes	No	Not sure	Total	*Number of cases*
Practices officially adopted by district (required for compliance with Healthy Schools Act)	Each school site maintains records of all pesticides used for at least four years, and makes these records available to the public	77%	13%	11%	100%	*497*
	District or school annually provides staff and parents with written notification of expected pesticide use at their school	88%	8%	4%	100%	*512*
	District or school maintains a list of parents to be notified of specific pesticide applications	79%	13%	8%	100%	*509*
	Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	92%	6%	2%	100%	*513*
Policies officially adopted by district	Written policy requiring the use of least-toxic pest management practices	59%	25%	16%	100%	*495*
	Written list of pesticide products approved for use in district schools	67%	23%	11%	100%	*500*
	Written policy requiring the monitoring of pest levels	31%	50%	19%	100%	*484*

[1] Some districts skipped these questions and indicated that they weren't applicable because they do not use any pesticides. It may be important to modify future questionnaires so that districts understand that the questions apply to them regardless of whether or not they use pesticides.

Table 3.2 Recordkeeping and Pest Monitoring/Detection Activities

		Percent	*Number of cases*
Which of the following describes your district's recordkeeping and pest monitoring/detection activities? Please check all that apply.	Buildings are inspected for potential pest problems	61%	*318*
	Records are kept of building inspections	30%	*155*
	Pests are monitored during the course of a year	55%	*287*
	Records are kept of results of pest monitoring	25%	*129*
	Records are kept of pest sightings	25%	*129*
	Records are kept of pest treatments used	88%	*459*
	No records are kept on pest management	7%	*34*
	No pest monitoring/detection activities	6%	*30*
	Total	n/a	*519*

Table 3.3 IPM Program Adoption

		Percent	*Number of cases*
Has school district adopted an IPM program?	Yes	69%	*356*
	No	17%	*90*
	Not sure	13%	*69*
	Total	100%	*515*
If yes, how many years ago?	Less than two years ago	6%	*17*
	Two years ago	28%	*85*
	Three years ago	32%	*97*
	Four years ago	18%	*54*
	Five years ago	5%	*14*
	More than five years ago	11%	*32*
	Total	100%	*299*

Table 3.4 Effectiveness and Long-Term Cost of IPM Program

		Percent	*Number of cases*
Do you think your district's IPM program has:	Resulted in more effective pest management	49%	*176*
	Made no difference in pest management effectiveness	23%	*81*
	Resulted in less effective pest management	15%	*52*
	Uncertain/no opinion	13%	*48*
	Total	100%	*357*
Do you think your district's IPM program has:	Reduced the long-term cost of pest management	33%	*116*
	Had no impact on the long-term cost of pest management	24%	*87*
	Increased the long-term costs of pest management	21%	*74*
	Uncertain/no opinion	22%	*79*
	Total	100%	*356*

Table 3.5 Barriers to Using IPM Practices

What are the barriers to using IPM practices in your district? Please rate the significance of each of the following:	Not at all significant	Somewhat significant	Very significant	Total	*Number of cases*
Age and condition of school facilities	45%	38%	17%	100%	*459*
Poor communication within the district	71%	22%	7%	100%	*454*
Budget restrictions	37%	39%	24%	100%	*463*
Inadequate staff training	50%	39%	12%	100%	*452*
Understaffing	34%	32%	34%	100%	*462*
Insufficient tool/equipment inventory	60%	30%	11%	100%	*447*
Lack of technical information resources	66%	26%	8%	100%	*452*
Contracting problems	78%	17%	5%	100%	*449*

Table 3.6 Official Adoption of Policies and Practices by IPM Program Adoption

Has district officially adopted the following practices or policies?		Has district adopted an IPM program?			Total	p^1
		Yes	No	Not sure		
Written policy requiring the use of least-toxic pest management practices	Yes	73%	26%	35%	60%	.000
	No	17%	60%	20%	25%	
	Not sure	9%	14%	45%	15%	
	Total	100%	100%	100%	100%	
	Number of cases	331	86	66	483	
Written list of pesticide products approved for use in district school	Yes	76%	44%	51%	67%	.000
	No	18%	42%	19%	22%	
	Not sure	6%	14%	30%	10%	
	Total	100%	100%	100%	100%	
	Number of cases	336	86	67	489	
Written policy requiring the monitoring of pest levels	Yes	40%	10%	11%	31%	.000
	No	44%	78%	39%	50%	
	Not sure	15%	12%	50%	19%	
	Total	100%	100%	100%	100%	
	Number of cases	326	86	62	474	
Each school site maintain records of all pesticides used for at least four years, and makes these records available to the public	Yes	85%	61%	55%	77%	.000
	No	10%	27%	13%	13%	
	Not sure	6%	12%	33%	10%	
	Total	100%	100%	100%	100%	
	Number of cases	335	85	64	484	
District of school annually provides staff and parents with written notification of expected pesticide use at their school	Yes	95%	70%	83%	89%	.000
	No	4%	27%	5%	8%	
	Not sure	1%	3%	12%	3%	
	Total	100%	100%	100%	100%	
	Number of cases	348	86	66	500	
District or school maintains a list of parents to be notified of specific pesticide applications	Yes	89%	58%	63%	80%	.000
	No	7%	34%	11%	12%	
	Not sure	4%	8%	27%	7%	
	Total	100%	100%	100%	100%	
	Number of cases	347	86	64	497	
Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	Yes	97%	80%	80%	92%	.000
	No	3%	17%	8%	6%	
	Not sure	0%	2%	12%	2%	
	Total	100%	100%	100%	100%	
	Number of cases	348	86	66	500	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 3.7 Percent of Districts Performing Recordkeeping and Pest Monitoring Detection Activities by IPM Program Adoption

	Has district adopted an IPM program?			p^1
	Yes	No	Not sure	
Buildings are inspected for potential pest problems	66%	45%	57%	.001
Records are kept of building inspections	34%	21%	19%	.007
Pests are monitored during the course of a year	60%	46%	46%	.019
Records are kept of results of pest monitoring	30%	13%	16%	.001
Records are kept of pest sightings	31%	11%	16%	.000
Records are kept of pest treatments used	95%	74%	78%	.000
No records are kept on pest management	4%	15%	9%	.002
No pest monitoring/detection activities	4%	12%	7%	.010
Number of cases	349	89	67	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 3.8 Types of Pest Control Contracts

		Percent	*Number of cases*
For what type(s) of pest control does your district have contracts with pest control businesses? Please check all appropriate boxes.[1]	One or more contract(s) for pest control	78%	*407*
	Termite control	37%	*192*
	Food service area pest control	55%	*292*
	Perimeter pest control	48%	*251*
	Grounds pest control	31%	*160*
	Have contracts for pest control, but uncertain about the type	1%	*7*
	Don't know whether the district has contracts for pest control	1%	*3*
	Do not contract with pest control businesses	22%	*115*
	Total	n/a	*525*

[1] These responses may slightly understate the amount of contracting that goes on. At least one respondent skipped this question (as well as all of page 1 and 2) but wrote in that they contract to a pest control company. Three districts indicating that they do not contract with pest control businesses reported—sometimes in the context of answering other questions—that they use outside pest control services on an "on-call" basis.

Table 3.9 Percent of Districts Using Any Practices within the Last Twelve Months to Manage Ants Inside School Buildings

		Percent	*Number of cases*
Did your district do anything to manage ants inside school buildings within the last 12 months?	Yes	81%	*429*
	No	17%	*92*
	Not sure	2%	*11*
	Total	100%	*532*

Table 3.10 Practices Used to Manage Ants Inside School Buildings

	Percent	*Number of cases*
Insecticidal spray from an aerosol can	16%	*70*
Exempt insecticidal spray from an aerosol can	35%	*151*
Insecticides sprayed using other application method	32%	*135*
Ant baits	69%	*297*
Soapy water spray	45%	*193*
Caulk in cracks to prevent entry of ants	50%	*213*
Improved sanitation	80%	*345*
Other	6%	*26*
Total	n/a	*429*

Table 3.11 Effectiveness of Practices Used to Manage Ants Inside School Buildings

	Very effective	Some-what effective	Un-certain	Some-what in-effective	Very in-effective	Total	*Number of cases*
Insecticidal spray from an aerosol can	44%	43%	5%	5%	3%	100%	*61*
Exempt insecticidal spray from an aerosol can	11%	67%	7%	12%	3%	100%	*127*
Insecticides sprayed using other application method	54%	39%	3%	2%	2%	100%	*107*
Ant baits	29%	56%	10%	2%	3%	100%	*258*
Soapy water spray	11%	60%	14%	13%	2%	100%	*171*
Caulk in cracks to prevent entry of ants	33%	54%	9%	4%	1%	100%	*186*
Improved sanitation	42%	48%	8%	2%	0%	100%	*302*
Other	67%	24%	10%	0%	0%	100%	*21*

Table 3.12 Practice Most Frequently Used to Manage Ants Inside School Buildings

		Percent	*Number of cases*
Which one practice did your district use most frequently to manage ants inside school buildings? Please check only one answer.	Insecticidal spray from an aerosol can	7%	*28*
	Exempt insecticidal spray from an aerosol can	8%	*34*
	Insecticides sprayed using other application method	12%	*49*
	Ant baits	34%	*142*
	Soapy water spray	9%	*36*
	Caulk in cracks to prevent entry of ants	2%	*9*
	Improved sanitation	19%	*81*
	Other	3%	*14*
	Checked more than one answer	6%	*25*
	Total	100%	*418*

Table 3.13 Decisions About When Treatment for Ants was Necessary

For each practice used, which best describes how your district decided when this treatment for ants was necessary?	Regular time intervals	When ants first noticed	When exceed pre-established threshold	After a certain number of complaints	Other	Total	*Number of cases*
Insecticidal spray from an aerosol can	1%	55%	15%	28%	1%	100%	*69*
Exempt insecticidal spray from an aerosol can	4%	61%	13%	20%	1%	100%	*139*
Insecticides sprayed using other application method	29%	23%	24%	20%	3%	100%	*121*
Ant baits	15%	61%	13%	10%	1%	100%	*289*
Soapy water spray	4%	83%	8%	4%	1%	100%	*191*
Caulk in cracks to prevent entry of ants	14%	64%	8%	12%	1%	100%	*203*
Improved sanitation	45%	43%	4%	7%	1%	100%	*321*
Other	14%	38%	10%	10%	29%	100%	*21*

Table 3.14 Percent of Districts Using Any Weed Management Practices Within the Last Twelve Months

		Percent	*Number of cases*
Did your district do anything to manage weeds within the last 12 months?	Yes	94%	*503*
	No	6%	*30*
	Total	100%	*533*

Table 3.15 Practices Used to Manage Weeds

	Percent	*Number of cases*
Broadcast treatment with herbicides	38%	192
Spot treatment with herbicides	82%	412
Use of mulches, ground covers, barrier cloth or plastic	55%	275
Physical controls such as hand pulling, cultivating, mowing	91%	456
Flaming	8%	38
Irrigation management	41%	206
Turf selection	20%	100
Other	3%	14
Total	n/a	503

Table 3.16 Effectiveness of Practices Used to Manage Weeds

	Very effective	Some-what effective	Un-certain	Some-what effective	Very in-effective	Total	*Number of cases*
Broadcast treatment with herbicides	59%	35%	5%	1%	1%	100%	*177*
Spot treatment with herbicides	77%	23%	0%	0%	0%	100%	*389*
Use of mulches, ground covers, barrier cloth or plastic	33%	60%	3%	3%	0%	100%	*265*
Physical controls such as hand pulling, cultivating, mowing	33%	56%	3%	6%	2%	100%	*432*
Flaming	16%	59%	8%	11%	5%	100%	*37*
Irrigation management	20%	61%	14%	4%	1%	100%	*192*
Turf selection	23%	62%	12%	2%	1%	100%	*93*
Other	38%	63%	0%	0%	0%	100%	*8*

Table 3.17 Location Where District Typically Has the Most Trouble with Weeds

	Percent	*Number of cases*
Athletic fields	20%	*98*
Playgrounds	11%	*56*
Landscaping	41%	*204*
Rights of way	9%	*43*
Fence rows	49%	*243*
Paved areas/cracks in asphalt	18%	*88*
Other	4%	*19*
Total	n/a	*498*

[1] Although respondents were instructed to choose only one location, 124 districts (25%) chose more than one location. The distribution shown here includes all responses. Limiting the distribution to districts selecting one location produces the same ranking of locations.

Table 3.18 Practice Used Most Frequently to Manage Weeds in Athletic Fields and in Playgrounds

Which one practice did your district use most frequently to manage weeds in the following locations?	Athletic fields		Playgrounds	
	Percent	*Number of cases*	Percent	*Number of cases*
Broadcast treatment with herbicides	14%	*65*	6%	*26*
Spot treatment with herbicides	40%	*189*	48%	*224*
Use of mulches, ground covers, barrier cloth or plastic	0%	*2*	3%	*16*
Physical controls such as hand pulling, cultivating, mowing	35%	*165*	34%	*160*
Flaming	0%	*2*	0%	*2*
Irrigation management	2%	*10*	2%	*7*
Turf selection	2%	*8*	0%	*2*
Other	2%	*8*	1%	*5*
More than one answer	5%	*26*	5%	*24*
Total	100%	*475*	100%	*466*

Table 3.19 Decisions about When Herbicide Treatment for Weeds was Necessary

Which best describes how your district decided when herbicide treatment for weeds was necessary?	Broadcast treatment with herbicides		Spot treatment with herbicides	
	Percent	*Number of cases*	Percent	*Number of cases*
Regular time intervals	71%	*129*	42%	*169*
When weeds are first noticed	12%	*21*	30%	*123*
When exceed a pre-established threshold	13%	*24*	25%	*102*
After a certain number of complaints	1%	*1*	2%	*8*
Other	3%	*6*	1%	*4*
Total	100%	*181*	100%	*406*

Table 3.20 Respondent Use and Awareness of IPM Information Resources

	Have accessed	Aware of but have not accessed	Not aware of	Total	*Number of cases*
DPR School IPM Web site	58%	21%	21%	100%	*503*
Brochures/handouts from DPR	59%	18%	22%	100%	*498*
Presentations on school IPM by DPR staff	29%	36%	34%	100%	*483*
Training workshops on school IPM	51%	30%	19%	100%	*501*
Information provided by licensed pest control businesses	56%	23%	20%	100%	*494*
University of California resources	27%	33%	40%	100%	*483*
Information from other Web site sources	35%	27%	37%	100%	*484*
California Department of Education, School Facilities Planning Division	21%	36%	42%	100%	*481*

Table 3.21 Scoring for Ant Management Scale

	Q10) Did district use practice? (7 items)		Q12) For districts that used a practice, how did they decide when treatment was necessary? (7 items)				Q13) Most frequently used practice: (1 item)
	Yes	No	Regular time intervals	When ants are first noticed	When number exceeds pre-established threshold	After a certain number of complaints	
Insecticidal spray from an aerosol can	0	+15	-15	-10	-1	-5	-15
Insecticides sprayed using other application method	0	+10	-10	-5	0	-3	-10
Exempt insecticidal spray from an aerosol can	0	0	-5	+2	+3	0	-3
Ant baits	+10	0	-5	+3	+5	0	0
Soapy water spray	+5	0	0	+5	+3	0	+5
Caulk in cracks	+15	0	+15	+10	+7	+5	+10
Improved sanitation	+15	0	+15	+10	+7	+5	+15

Table 3.22 Scoring for Weed Management Scale

	Q15) Did district use practice? (7 items)		Q17) For districts that used herbicides, how did they decide when treatment was necessary? (2 items)				Q18) Most frequently used practice for: (2 items)	
	Yes	No	Regular time intervals	When weeds are first noticed	When number exceeds pre-established threshold	After a certain number of complaints	Athletic fields	Play-grounds
Broadcast treatment with herbicides	0	+10	-15	-10	-1	-5	-15	-20
Spot treatment with herbicides	0	+5	-10	-5	0	-3	-10	-15
Physical controls such as hand pulling, cultivating, mowing	+10	0	n/a	n/a	n/a	n/a	+10	+10
Flaming	+10	0	n/a	n/a	n/a	n/a	+10	+10
Mulches, ground covers, barrier cloth or plastic	+15	0	n/a	n/a	n/a	n/a	+15	+15
Irrigation management	+15	0	n/a	n/a	n/a	n/a	+15	+15
Turf selection	+15	0	n/a	n/a	n/a	n/a	+15	+15

Table 3.23. Average Scores and Variability on IPM Scales

	Range	Mode	Median	Mean	Standard Deviation	Number of cases
Healthy Schools Act Compliance Scale	0-40	40	40	35.5	10.8	487
IPM Program Scale	0-40	10	20	19.2	10.9	470
Ant Management Scale	0-148	50	93	88.7	30.8	429
Weed Management Scale	0-155	95	67	69.4	32.2	503
Information Resource Awareness Scale	0-8	8	6	5.6	2.5	450
Information Resource Use Scale	0-8	3	3	3.3	2.3	450

Chapter 4: Inter-relationship of District and Respondent Characteristics

District characteristics, in particular, are not independent of each other. For example, unified school districts tend to be larger, with more schools and higher ADA, while elementary school districts tend to be smaller, with fewer schools and lower ADA (Appendix Table 4.3). The inter-relationships of district characteristics will become important in the next chapter when the contributions of multiple district characteristics to variability in IPM program adoption, HSA compliance, and the use of IPM policies and practices are explored. In multivariate analysis, when two variables are highly correlated, the stronger of the two is often included in the explanatory model, while the weaker one is omitted so that the contribution of a third, more independent variable can be used to explain additional variance in the dependent variable. Without understanding the inter-relationships between these shadow variables, it would be easy to draw erroneous policy conclusions from the model's results.

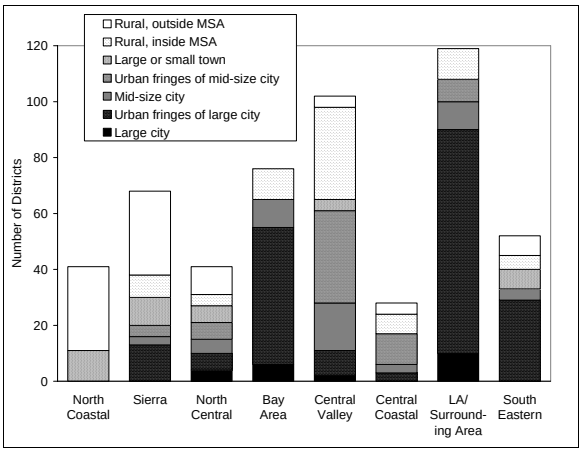
These interrelationships also remind us that bivariate relationships between an independent and dependent variable are often misleading. For example, Table 5.3 summarizes the relationships between a series of independent variables (population area, region, district type, number of schools in the district, etc.) and mean scores on each of four scales. Each comparison represents a bivariate relationship—between, for example, ADA and the ant management scale. Population area is significantly related to the ant management scale, but it is also highly correlated with ADA and number of schools in a district. In Table 5.6, ADA drops out of the model in deference to population area, which, along with other variables related to size (adoption of an IPM program and the IPM program scale) are retained. Thus, it is important to remember that size is indirectly related to the ant management scale.

This chapter, therefore, discusses the significant inter-relationships between district characteristics that will set the stage for our understanding of the multivariate models in the next chapter. For completeness, inter-relationships between respondent characteristics are explored and between district and respondent characteristics as well in case these contribute to or confound models explaining the dependent variables.

Inter-relationship of District Characteristics

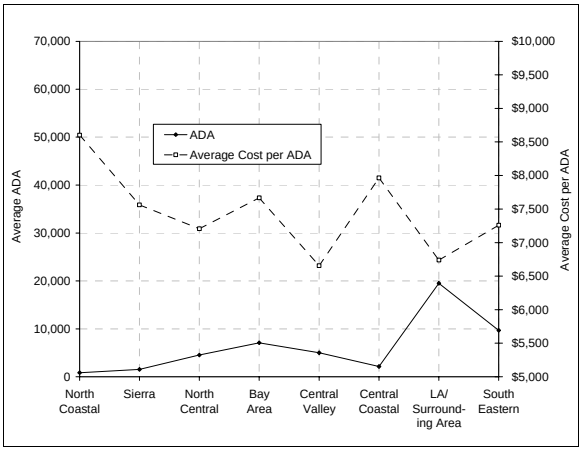
Two important district characteristics, population area and region, are strongly related to each other (see Figure 4.1 and Appendix Table 4.1). School districts located in large cities or their urban fringes are concentrated in Los Angeles and the surrounding region and in the Bay Area. Districts in the urban fringes of mid-sized cities are found primarily in the Central Valley. Rural districts inside a Metropolitan Statistical Area (MSA) are concentrated in the Central Valley while those outside an MSA are largely found in the North Coastal and Sierra regions.

Figure 4.1 Population Area by Region



Regions vary on a number of characteristics that may influence the use of and attitude towards IPM in schools. Some regions are more urban (Los Angeles, the Bay Area, the South Eastern suburbs, the medium-sized cities of the Central Valley) while others are more rural (the North Coast, the Sierras, portions of the Central Valley) (see Figure 4.1). The North Coast is the most rural region, with the fewest schools per district, the lowest ADA and the highest cost per ADA of any region in the state (56% of North Coast respondents represented districts with a cost per ADA exceeding $7,400) (Appendix Table 4.1). Average daily attendance (ADA) is markedly higher in Los Angeles and the surrounding area, while the average cost per ADA in both Los Angeles and the Central Valley is significantly lower than in the rest of the state (Figure 4.2).

Figure 4.2 ADA and Cost per ADA by Region



Population area, ADA and type of district are also related (see Figures 4.3-4.5 and Appendix Table 4.2).

- Urbanized areas are more apt to have unified school districts, particularly in the urban fringes of large cities (Figure 4.3).
- Districts in large cities have a large number of schools and high ADA (Figure 4.4). More than half of these districts have 20 or more schools and an ADA over 7,500. The mean number of schools in unified districts is 23, with a mean ADA of 15,655 (Figure 4.5).
- In contrast, elementary school districts are more common in rural areas (Figure 4.3). Rural districts have few schools and a low ADA (Figure 4.4). About half of rural districts have just two schools and an ADA under 500. The mean number of schools in elementary districts is six with a mean ADA of 2,603 (Figure 4.5).
- There are not very many high school districts, but they are relatively more common in large or small towns (Figure 4.3). The mean number of schools in high school districts is 10 with a mean ADA of 8,112 (Figure 4.5).
- Costs per ADA are significantly lower in mid-sized cities and the suburbs of large cities and notably higher in rural areas (Figure 4.4).

Figure 4.3 District Type by Population Area

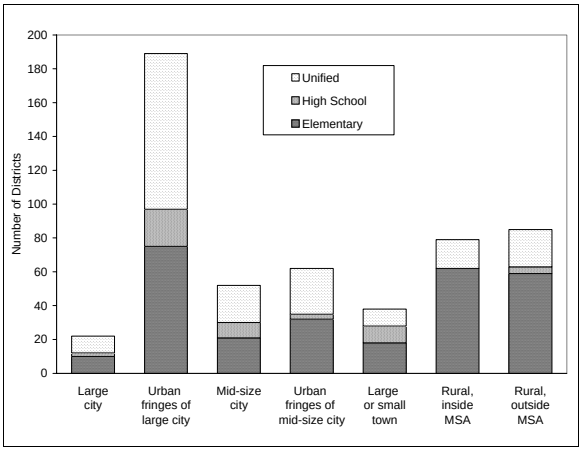


Figure 4.4 ADA and Cost per ADA by Population Area

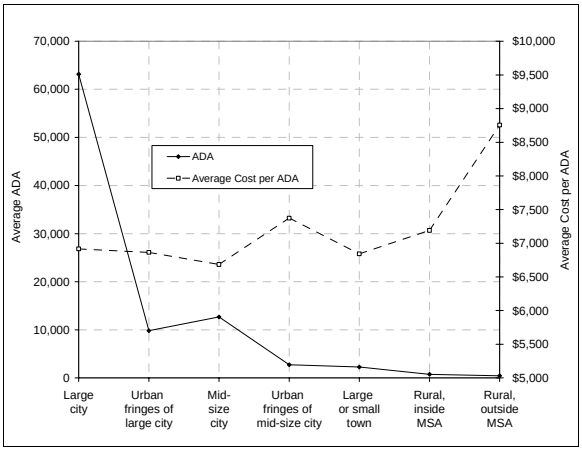
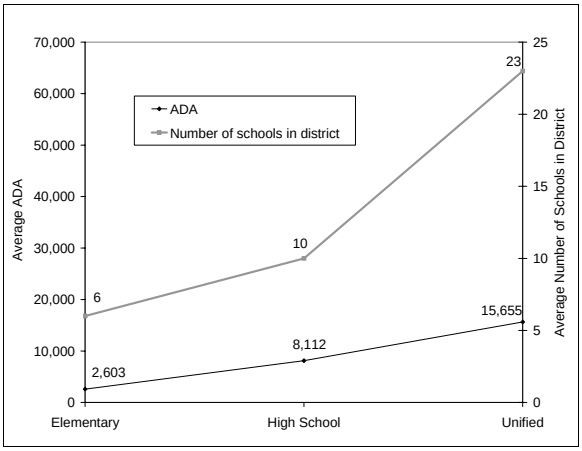


Figure 4.5 ADA and Number of Schools in District by District Type



This constellation of attributes does not mean that rural schools, with high average expenditures per student, can afford the adoption of IPM practices. Costs are higher in rural districts because they lack the economies of scale of urban ones. The same basic overhead has to be provided to serve fewer children. High costs per ADA do not necessarily describe a wealthy district.

The same district characteristics are also related to participation in DPR's IPM training workshops up through June of 2003. Large, urban and unified districts were most apt to have participated in the training workshops (Table 4.1). One-fourth of all districts with 20 or more schools or with 10,000 or more students have taken part in the workshops. Participation is also above average in large and mid-sized city districts (23% and 21%) and in districts located in the urban fringes of large cities (19%). School districts in Los Angeles and the Bay Area (both 24%) are also more likely to have taken part in the training workshops than those in other regions (varying from 0% to 17%). Participation is lowest on the North Coast, in the Sierras and in the South Eastern part of the state and in smaller, rural and elementary school districts. Smaller districts, those in these three regions, and especially elementary school districts would be the logical focus for the next wave of DPR's IPM training. Indeed, DPR's July 2005 workshops targeted rural districts in the Northern part of the state.

Inter-relationship of Respondent Characteristics

As indicated earlier, most respondents (84%) served as the designated IPM coordinator for their district. Most (75%) of these coordinators work in Maintenance and Operations, primarily as director/coordinators or manager/supervisors (Table 4.2). More of the respondents who were not the designated IPM coordinators were in administration, business offices or safety/risk management (37% vs. 25% of the IPM coordinators).

Respondent characteristics are more important than district characteristics in predicting pest management responsibilities (Table 4.3 and Appendix Table 4.5). Specific pest management responsibilities vary by a respondent's position in the school district and their role as IPM coordinator. Since Maintenance and Operations (M&O) director/coordinators were most frequently the designated IPM coordinator, this job classification was used as the reference category in the regression analyses that identified which positions were more likely to have specific pest management responsibilities. The signs in Table 4.3 indicate whether a particular job category was more (+) or less (-) likely than the M&O director/coordinators to have responsibility for a given task.

The respondents' role as IPM coordinator and their job category are strongly related to their pest management responsibilities. IPM coordinators are involved in pest management and pesticide safety training, setting pest management policies, deciding when to apply pest management treatments and which pest management practices to use, and keeping records of all pest management treatments used (Table 4.3 and Appendix Table 4.6). M&O director/coordinators choose which pest management practices to use and direct others in applying pest management treatments (82%) (Appendix Table 4.7). M&O workers are the ones who apply the treatments (Tables 4.3 and 4.4).

Respondents in administrative positions are more apt to set pest management policies and less apt to be involved in deciding when to apply pest management treatments, deciding which pest management practices to use, and applying pest management treatments. Compared to M&O directors and coordinators, respondents employed in the business offices are less likely to be involved in pest management and pesticide safety training, in setting pest management policies, in deciding when to apply pest management treatments and which practices to use, and in applying pest management treatments. Safety/risk management personnel are less likely to be involved in the practical aspects of pest management, including deciding which pest management practices to use, applying or directing others to apply treatments or keeping records of treatments used.

Inter-relationship of District and Respondent Characteristics

Only a few relationships were found between the district and respondent characteristics measured. This means that the effects of region, population area, size and type of school district and cost per ADA cannot be attributed to or explained by qualities of the individuals who completed the questionnaire. For example, although 84% of the respondents said they were the IPM coordinator, whether they were or not was randomly distributed across all types of school districts. Non-coordinators were not concentrated in a particular type of school district in a particular type of region or population area. So, although IPM coordinators know more about the policies and

practices of an IPM program and therefore responded differently to questions about them, this difference does not explain district variations in these policies and practices.

One of the significant relationships between district and respondent characteristics is that surveys filled out by administrators are predominantly from smaller districts and elementary school districts. Of 70 surveys completed by administrators, 41 (59%) were from elementary schools districts with ADA's under 500 (see Appendix Tables 4.8 and 4.9). Another 16 (23%) were from elementary districts with ADA's between 500 and 999. Since administrators in small districts wear many hats, it is helpful to remember that, in this sample, administrative involvement in IPM policies and practices largely reflects the experiences of administrators in small, rural and elementary school districts. In contrast, safety/risk managers were more apt to fill out the survey in High School and Unified districts.

The only regional difference involved the North Central region, where M&O workers were more likely to complete the survey and M&O managers/supervisors were less likely to do so.

These relationships will be useful in understanding the more complex findings in Chapter 5.

Table 4.1 DPR IPM Training Attendance by District Characteristics

		Had district attended a DPR IPM training workshop during 2002/2003?						
		Percent			Number			
		Yes	No	Total	Yes	No	Total	p^1
Overall		12%	88%	100%	63	464	527	
Population area	Large city	23%	77%	100%	5	17	22	.000
	Urban fringes of large city	19%	81%	100%	36	153	189	
	Mid-size city	21%	79%	100%	11	41	52	
	Urban fringes of mid-size city	2%	98%	100%	1	61	62	
	Large or small town	8%	92%	100%	3	35	38	
	Rural, inside MSA	1%	99%	100%	1	78	79	
	Rural, outside MSA	7%	93%	100%	6	79	85	
Region	North Coastal	7%	93%	100%	3	38	41	.000
	Sierra	7%	93%	100%	5	63	68	
	North Central	17%	83%	100%	7	34	41	
	Bay Area	24%	76%	100%	18	58	76	
	Central Valley	0%	100%	100%	0	102	102	
	Central Coastal	0%	100%	100%	0	28	28	
	LA/Surrounding Area	24%	76%	100%	28	91	119	
	South Eastern	4%	96%	100%	2	50	52	
District type	Elementary	8%	92%	100%	21	256	277	.004
	High School	14%	86%	100%	7	43	50	
	Unified	18%	83%	100%	35	165	200	
Number of schools in district	2	1%	99%	100%	1	101	102	.000
	3-4	4%	96%	100%	3	75	78	
	5-9	11%	89%	100%	17	134	151	
	10-19	18%	82%	100%	21	97	118	
	20 or more	27%	73%	100%	21	57	78	
Average daily attendance (ADA)	Under 500	4%	96%	100%	5	133	138	.000
	500-2,499	4%	96%	100%	5	128	133	
	2,500-7,499	16%	84%	100%	19	103	122	
	7,500 or more	25%	75%	100%	34	100	134	
Cost per ADA	Under $6,300	10%	90%	100%	14	127	141	.013
	$6,300-$6,699	20%	80%	100%	26	106	132	
	$6,700-$7,399	11%	89%	100%	13	108	121	
	$7,400 or more	8%	92%	100%	10	123	133	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.2 IPM Coordinator Designation by Job Category

	Designated IPM Coordinator?			
	Percent		*Number*	
	Yes	No	*Yes*	*No*
Administration	14%	16%	*57*	*12*
Front office/business	6%	18%	*25*	*13*
Safety/risk management	5%	3%	*20*	*2*
Maintenance & Operations Director/Coordinator	37%	16%	*153*	*12*
Maintenance & Operations Manager/Supervisor	28%	23%	*114*	*17*
Maintenance & Operations Worker	10%	23%	*41*	*17*
Total	100%	100%	*410*	*73*

Table 4.3 Summary of Significant Relationships from Logistic Regression Model Predicting Pest Management Responsibilities

	IPM Coor-dinator	Job Category				
		Admin-istration	Front office/ business	Safety/risk manag-ement	M & O Manager/ Supervisor	M & O Worker
Pest management and pesticide safety training	+ + +		– – –			–
Setting pest management policies	+ + +	+ + +	–			– –
Deciding when to apply pest management treatments	+ +	– – –	– – –			
Deciding which pest management practices to use	+ +	–	– – –	– –	–	
Applying pest management treatments		–	– –	– – –		+ + +
Directing others to apply pest management treatments				–		– – –
Keeping records of all pest management treatments used	+ +			– – –		
Other responsibilities			+			

The reference category for job area is Maintenance and Operations Director/Coordinator. Plus and minus symbols reflect the direction of a category's significant difference from the reference group. The + symbol indicates that a group is more likely to have a responsibility than M & O Director/Coordinators, while a - symbol indicates that a group is less likely to have this responsibility. A single symbol reflects a significance level of .05, two symbols, .01 and three, .001 or less. The lack of a symbol means that the category does not difference from the reference group on a given responsibility.

More information describing the models is displayed in Appendix Table 4.4

Table 4.4 Pest Management Responsibilities by Job Category

	Job Category					
	Admin-istration	Front office /business	Safety/risk manage-ment	M & O Director/ Coor-dinator	M & O Manager/ Supervisor	M & O Worker
Pest management and pesticide safety training	61%	32%	82%	66%	71%	44%
Setting pest management policies	72%	27%	59%	54%	43%	25%
Deciding when to apply pest management treatments	52%	35%	45%	74%	71%	71%
Deciding which pest management practices to use	61%	32%	41%	77%	65%	67%
Applying pest management treatments	16%	14%	9%	32%	34%	65%
Directing others to apply pest management treatments	75%	57%	41%	82%	74%	49%
Keeping records of all pest management treatments used	61%	68%	68%	73%	66%	60%
Other responsibilities	0%	14%	0%	3%	1%	7%
Number of cases	*69*	*37*	*22*	*164*	*131*	*55*

Chapter 5: Multivariate Analysis of School District IPM Program Adoption, Policies, and Practices

Identifying district characteristics that are significantly related to IPM-related activities can assist DPR in targeting future training and outreach efforts. This chapter identifies district characteristics that are related to variations in IPM program adoption and the four IPM policy and practice scales described in the preceding chapter (the HSA compliance scale, IPM program scale, and the ant and weed management scales). This is accomplished through the use of statistical tools (logistic regression for program adoption and linear regression for the scales) that measure the strength of the relationship between district characteristics and their IPM-related actions, taking all other measured characteristics into account. Regression models are selected that explain the greatest amount of variation in IPM-related behaviors with the fewest number of district characteristics or variables. Three of the five models are fairly successful in predicting variation in the HSA, IPM program and ant management scales with three variables in each model. The other two models – IPM program adoption and the weed management scale – include only two variables and explain very little of the variance.

Adoption of an IPM Program

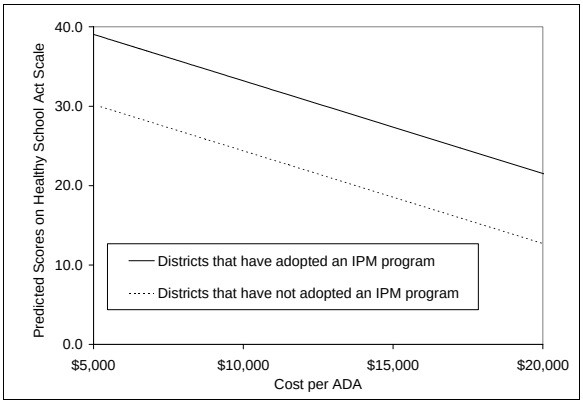
Several district characteristics are related to whether or not a district has adopted an IPM program (Table 5.1). Type of district and size (measured by ADA in the model) are significantly related to program adoption (Table 5.2). High school districts are much more likely than elementary school districts to have adopted an IPM program, while size – measured by either ADA, as in the model, or by number of schools – increases the likelihood of program adoption. Size, however, has less of an effect on the probability of IPM program adoption in high school districts – there is, in fact, a slight decline as ADA increases – while it increases program adoption for both elementary and unified school districts (Appendix Figure 5.1). Size is also related to the length of time an IPM program has been in effect. Larger school districts tended to be the early adopters while smaller districts are more apt to have instituted their IPM program in the past two years.

The model predicting IPM program adoption is a weak one, accounting for only 6.6% of the variance among responding school districts. The inability to predict IPM program adoption is probably due in part to the fact that there is no widely accepted definition of such a program.

The Healthy Schools Act Compliance Scale

Although population area and region are individually related to compliance with the HSA, this relationship is overshadowed in a regression model by other, more strongly related variables (Table 5.3). In the model described in Table 5.4, adoption of an IPM program, average cost per ADA, and scores on the IPM program scale are significantly related to HSA scale scores. Together, these three variables explain almost a fourth of the variability in HSA scale scores. Compliance actually decreases with increasing costs per student – a function, perhaps, of the greater costs of educating children in rural areas and the lower compliance rates of rural districts. Rural areas have means of 28.3 and 30.9 on the HSA scale while means for more urban areas vary between 33.5 and 37.3 (see Table 5.3). In contrast, HSA compliance is greater in districts that have adopted an IPM program (means of 36.5 vs. 26.8 for those that haven't) and that have higher scores on the IPM program scale – all activities that are related to the requirements of the HSA and incorporate what districts appear to define as an IPM program (Figure 5.1).

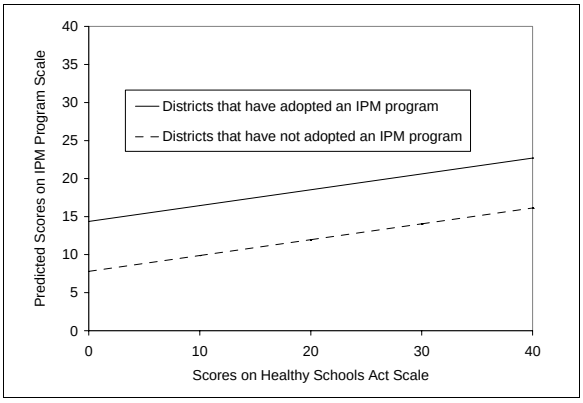
Figure 5.1 Predicted Scores on the Healthy Schools Act Scale by IPM Program Adoption and Cost per ADA



IPM Program Scale

Three variables explain 17% of the variability in the IPM program scale: whether or not a district has adopted an IPM program, compliance with the HSA and ADA. Districts are more likely to adopt IPM-related policies, monitor pest levels and keep records of pest monitoring and treatments if they have adopted an IPM program, have greater compliance with the HSA, and have higher ADA (Table 5.5 and Figure 5.2). Population area and region are individually related to the IPM program scale, but these relationships disappear when the three more strongly related variables are included in the regression model (Table 5.3 and Appendix Table 5.2).

Figure 5.2 Predicted Scores on the IPM Program Scale by IPM Program Adoption and Scores on the Healthy Schools Act Scale



Ant and Weed Management Scales

IPM-compatible ant management practices occur more often in districts that have adopted an IPM program and score highly on the IPM program scale (Table 5.6). School districts in rural areas inside an MSA are less likely to use IPM-compatible ant management practices (Figure 5.3). These three variables – population area, IPM program adoption and scores on the IPM program scale – predict 16.7% of the variance in the districts' ant management scale scores.

Region, district type and district size are individually related to the ant management scale, but these relationships are no longer significant when the more strongly related variables are included in the regression model (Table 5.3 and Appendix Table 5.3).

Figure 5.3 Predicted Scores on the Ant Management Scale by Scores on the IPM Program Scale and Population Area

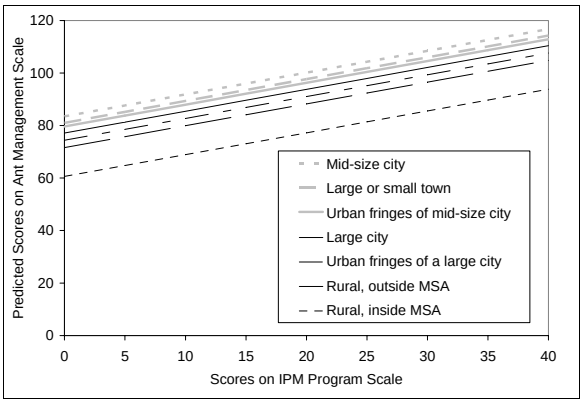
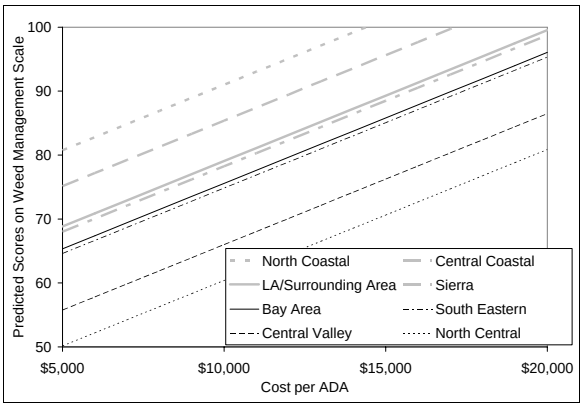


Figure 5.4 Predicted Scores on the Weed Management Scale by Cost per ADA and Region



Region and cost per ADA are related to weed management practices (Table 5.7). School districts in North Central California and the Central Valley were less likely to use IPM-compatible weed management practices. These practices, however, occurred more often in school districts with higher average costs per ADA (Figure 5.4). The model predicting weed management practices is weak, accounting for only 7.2% of the variance among responding school districts.

District size is individually related to the weed management scale. Size and scores on the scale are inversely related; smaller districts have higher weed management scores. However, when region – which is related to size – is added to the regression model, this relationship is no longer significant (Appendix Table 5.5).

Comparison of Regression Models for IPM Program Adoption and the Four IPM Policy and Practice Scales

These models vary in how well they predict the variable of interest. The model for the HSA scale has the greatest proportion of explained variance (23.8%) while the model for IPM program adoption has the lowest proportion of explained variance (6.6%). These variations may be due in part to the nature of the variable being predicted.

For example, since there is no widely accepted definition of an IPM program, this measure provides relatively general information about a district. In contrast, the four HSA requirements are very precisely stated. In the questionnaire, respondents were asked to indicate whether their district had complied with each of the four requirements. This precision led to a model with the greatest proportion of explained variance.

In other cases, the variations may have more to do with the demands of different types of IPM-compatible practices. District characteristics predict ant management practices better than weed management (17.2% vs. 7.2% of explained variance). This is probably due in part to the fact that IPM-compatible ant management practices are relatively easy to implement and are not labor intensive. Requiring more of a commitment, weed management may be more affected by the culture of a school district – a variable that cuts across the district variables available for use in the study.

The district characteristics that are important in the final models also vary quite a bit. Although IPM program adoption is difficult to predict, it does a good job of explaining the variance in three of the four policy and practice scales. Weed management is the only scale not related to IPM program adoption. For the other three scales, districts that have adopted a program have significantly higher scores.

ADA is significant in the final models for both IPM program adoption and the IPM program scale. In both cases, larger districts have more IPM-compatible programs, policies, and practices.

Although cost per ADA is significant in the final models for both the HSA scale and weed management scales, the direction of the relationship is not the same. Cost per ADA and the HSA scale are negatively related; as cost per ADA increases, scores on the HSA scale decrease. But cost per ADA and the weed management scale are positively related; as cost per ADA increases, so do weed management scores.

Three other district characteristics are only significant in one of the four final models: district type is only significant in the model for IPM program adoption; population area is only significant in the ant management model; and region is only significant in the weed management scale model.

Barriers to Using IPM Practices

Relationship of district characteristics to barriers. Since most district characteristics were not related to the perceived significance of specific barriers to using IPM practices at the bivariate level, no multivariate models were created. However, there are a few noteworthy relationships. District size was significantly related to four barriers to using IPM practices in schools districts: poor communication; budget restrictions; understaffing; and a lack of technical information resources (Appendix Tables 5.9 and 5.10). The relationship of the barriers to the number of schools in a district is curvilinear (Appendix Figures 5.2-5.5). Respondents from middle-sized school districts are more likely to cite the four barriers as “somewhat or very significant” barriers to using IPM practices while those from the smallest and largest districts see these as less of a problem.

Similarly, budget restrictions and inadequate staff training are more of a problem for districts with average costs per ADA (Appendix Table 5.11). For example, more of the school districts with the lowest cost per ADA (under $6,300) and the highest cost (over $7,400) cite inadequate staff training as “not at all significant” as a barrier to using IPM practices (53% and 57% respectively vs. 50% and 36% for the two middle categories). In contrast, understaffing becomes a less significant barrier as costs per ADA increase. Indeed, respondents from schools with the highest cost per ADA are the most likely to perceive all three barriers as “not at all significant” barriers to using IPM practices (57% describing inadequate staff training in this way, 50%, budget restrictions, and 41%, understaffing).

Population area, region and district type have very little impact on respondents' perceived barriers to using IPM practices. Only three relationships involving these variables were significant. Respondents from large cities and rural areas inside MSAs are more apt to see contracting problems as “somewhat or very significant” (Appendix Table 5.6). North Coast and Sierra respondents are less

likely to cite understaffing as a significant barrier (Appendix Table 5.7). Finally, respondents from unified school districts are more apt to see budget restrictions as "somewhat or very significant" barriers to using IPM practices in their districts (Appendix Table 5.8).

These relationships do have some implications for DPR's training program. DPR staff can explore what the contracting problems are in the large cities and rural areas and then research solutions that can be shared with school districts in these areas. For districts where understaffing constitutes a significant barrier to IPM practices, DPR could develop less labor-intensive IPM methods or help prioritize pest control needs. Finally, DPR may need to recognize that, despite excellent training, organizational constraints in middle-sized school districts may limit their adoption of IPM policies and practices.

Impact of barriers on IPM program adoption. Five of the eight barriers to using IPM practices are significantly related to school district adoption of an IPM program (Table 5.8). The more significant the barrier, the less likely districts were to adopt such a program. The barriers most strongly associated with non-adoption were a lack of technical information resources and inadequate staff training—63% and 60% of districts identifying these as "very significant" barriers had not adopted an IPM program. The proportion of districts adopting an IPM program declined less dramatically with the increasing significance of three other barriers—insufficient tool/equipment inventory, understaffing and budget restrictions.

Impact of barriers on IPM policy and practice scales. Four perceived barriers to using IPM practices are significantly related to the HSA, IPM program and ant management scales (Table 5.9 and Figures 5.5-5.7). There was no relationship between perceived barriers and the weed management scale. Respondents who describe inadequate staff training, understaffing, insufficient tool/equipment inventory and a lack of technical information resources as "somewhat or very significant" barriers represent districts that score significantly lower on the HSA, IPM program, and ant management scales. For example, Figure 5.6 shows that districts describing these four barriers as "very significant" have means of 15 or less on the IPM program scale while those describing them as "not at all significant" have means greater than 20.

Although DPR cannot change the problem of understaffing, it can help districts with staff training and expand its efforts to distribute technical information.

Figure 5.5 Mean Scores on the Healthy Schools Act Scale by Significant Barriers to Using IPM Practices

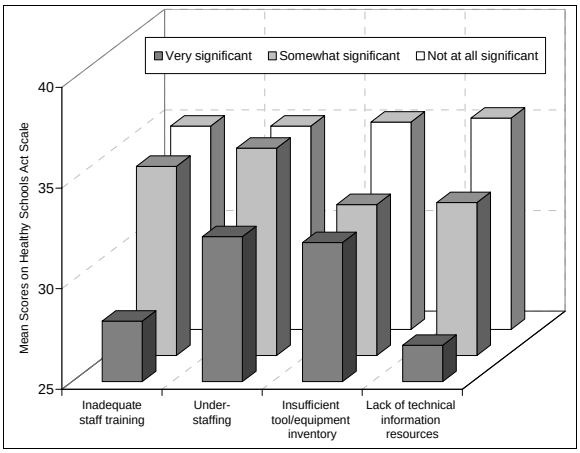


Figure 5.6 Mean Scores on the IPM Program Scale by Significant Barriers to Using IPM Practices

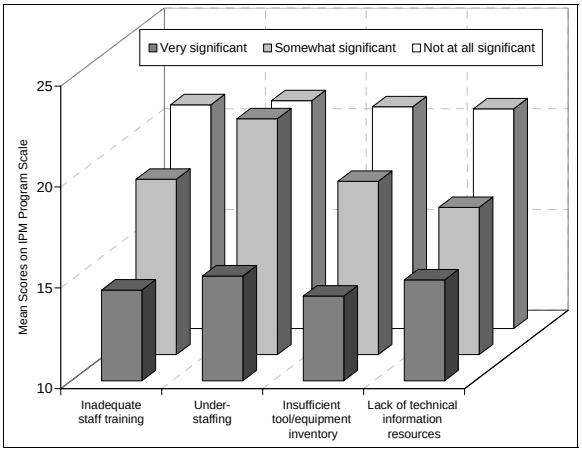
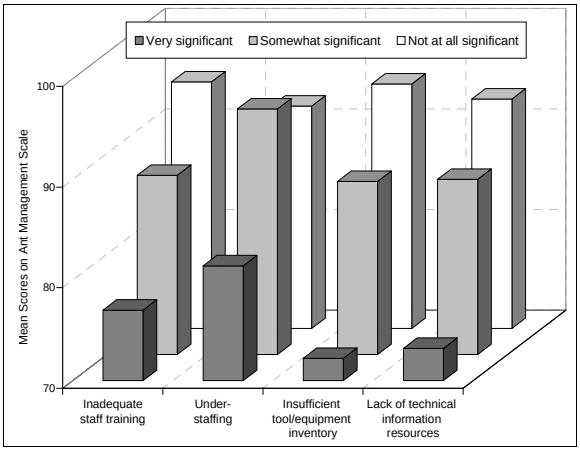


Figure 5.7 Mean Scores on the Ant Management Scale by Significant Barriers to Using IPM Practices

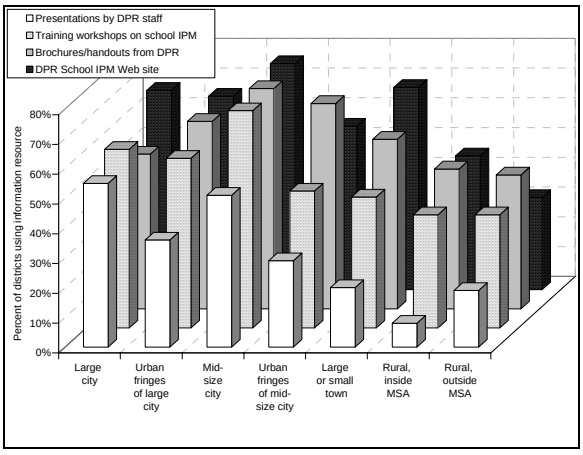


IPM Information Resource Awareness and Use

Relationship of district characteristics to IPM information resource awareness and use. District characteristics are significantly related to respondent awareness and use of information resources on IPM (Table 5.10). Population area, region, district type, ADA, cost per ADA and participation in DPR's IPM training are all related to awareness and use of these resources. In general, respondents from rural areas– and the North Coast in particular – were less aware and less apt to use IPM information resources, while those representing larger districts, high school districts, and those that had participated in DPR's IPM training were much more aware and more likely to have used this information.

The most important predictor of use of IPM information resources is participation in DPR training (Table 5.11). Respondents from districts that had participated were significantly more likely to have used information resources. In addition, respondents from rural areas, outside an MSA, were much less likely to be aware of these resources while those representing mid-sized cities, the urban fringes of large cities, the Central Valley region and high school districts were more likely to use them (Table 5.11 and Appendix Tables 5.12 and 5.18).

Figure 5.8 Percent of Districts Using IPM Information Resources by Population Area



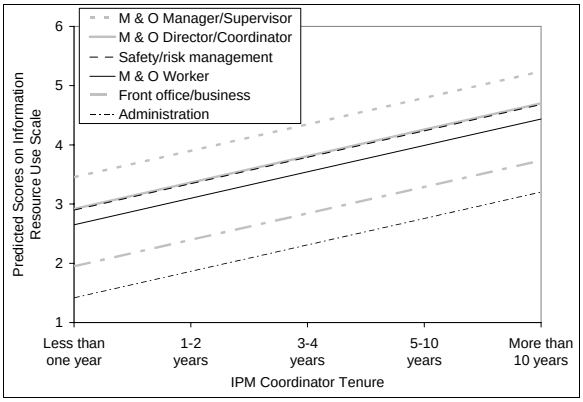
However, variations in awareness and use depended upon the particular information resource. While participation in school IPM training workshops was related to awareness and use of five of the eight resources, population area was significantly related to all eight (Appendix Table 5.13). Rural districts have lower awareness and use levels for all the information resources (Figure 5.8). In addition to their lack of involvement in the training workshops, they are significantly less aware of and less likely to have used most of the other resources, including the information provided by licensed pest control businesses. Only large city districts are less aware of the CDE's School Facilities Planning Division than rural districts inside or outside an MSA.

Respondents from the North Coastal, Central Coastal, South Eastern, and North Central regions were less likely to have attended the workshops or presentations by DPR staff (Appendix Table 5.14). The North Coastal, Sierra and South Eastern regions were also less aware of DPR's Web site and brochures. The North Coastal region, in particular, and the Sierra, North Central and Bay Area regions were less aware of and less likely to have used information provided by licensed pest control businesses.

Elementary school districts, which are disproportionately rural, are similarly uninformed about DPR's resources (the Web site, brochures, presentations, and training workshops, University of California resources or other Web sites) while those from high school districts were both more aware and more likely to have participated in them (Appendix Tables 5.15).

Relationship of respondent characteristics to IPM information resource awareness and use. Respondent characteristics were also related to IPM information resource awareness and use. IPM coordinators were more aware of information resources, but no more likely to use them than respondents who did not serve in this capacity (Table 5.12 and Figure 5.9). However, increased tenure as IPM coordinator significantly increased both awareness and use.

Figure 5.9 Predicted Scores on the Information Resource Use Scale by Job Category and Coordinator Tenure



Respondents in administrative positions—regardless of their IPM coordinator status—were less aware of and less likely to use the resources than respondents in other positions (Table 5.12 and Appendix Table 5.20). Unless they were IPM coordinators, business office respondents were also less aware of and less apt to use information resources. M&O manager/ supervisors were the real experts in using information resources. They were more likely than the director/coordinators to use information resources, especially when neither served as the IPM coordinator.

Respondents whose responsibilities included pest management and pesticide safety training were much more likely to be aware of and use information resources (Table 5.13). Those who set pest management policies were also more likely to use information resources. With these exceptions, pest management responsibilities had no effect on either awareness or use of information resources.

The resources most commonly used by IPM coordinators are DPR's brochures (63%) and School IPM Web site (61%), information provided by licensed pest control businesses (57%), and training workshops on school IPM (54%) (Appendix Table 5.22). Information provided by licensed pest control businesses reached even a majority of respondents who did *not* serve as IPM coordinators (51%).

Safety/risk managers and M&O manager/ supervisors are the most frequent users of DPR's School IPM Web site and its brochures and handouts. (Appendix Table 5.23) Roughly 70% of both groups have utilized these resources. Attendance at DPR's training workshops is more common among M&O Director/Coordinators and Manager/Supervisors (60 and 62% respectively have attended). Roughly 60% of all three groups have used information provided by licensed pest control businesses.

Relationship of Resource Awareness and Use to IPM Program Adoption

Seven of the eight IPM information resources were significantly related to adopting an IPM program (Table 5.14). Awareness and use of a resource each increased the likelihood of districts adopting an IPM program. The two resources most strongly associated with non-adoption were a lack of awareness of DPR's training workshops on school IPM and their school IPM Web site; half of the respondents who were unaware of these resources came from districts that had not adopted an IPM program. Program adoption was almost as strongly related to awareness and use of DPR brochures, staff presentations and University of California resources and somewhat less strongly related to awareness and use of information from other Web site sources and CDE's School Facilities Planning Division. Information provided by licensed pest control businesses was the only resource where awareness and use did not differentiate program adoption.

Relationship of Information Resource Awareness and Use to the Four IPM Policy and Practice Scales

Awareness and use of IPM information resources is also related to school district performance on three of the policy and practice scales: the HSA scale, the IPM program scale, and the ant management scale. The degree of awareness and use of all eight resources is significantly related to both the HSA and IPM program scales (Table 5.15). Use of DPR's School IPM Web site, the training workshops, and information from licensed pest control businesses are the most strongly related to the HSA scale, while the workshops and information from licensed pest control businesses and other Web site sources are the most highly correlated with the IPM program scale.

Use of all but one of the resources is significantly related to scores on the ant management scale (Table 5.15). Information from licensed pest control businesses is the one resource that is not related to district scores on ant management. Use of DPR's School IPM Web site and their brochures and handouts are the most highly related to ant management practices. In contrast, scores on the weed management scale are unrelated to use of any of the resources.

Contribution of Significant Barriers and IPM Information Resource Use to Model Predicting IPM Program Adoption

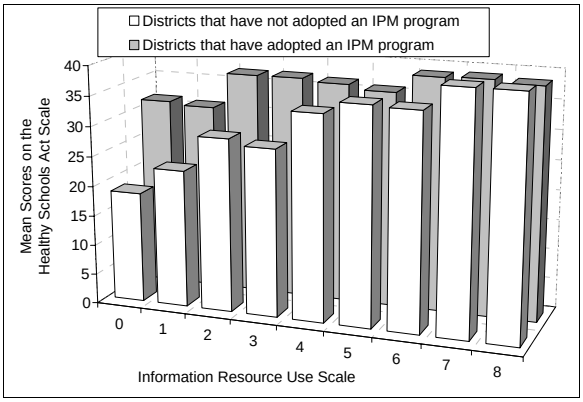
The original model predicting IPM program adoption was a weak one, using only two variables (district type and ADA) to predict less than 7% of the variability in program adoption in California's school districts (Table 5.2). When variables associated with district type and ADA are entered into the model, the greater immediacy of the additions to program adoption improve the proportion of explained variance to 19.2% (Table 5.16). The most significant predictors of non-adoption are location in the Central Coastal region, the perception of inadequate staff training as a significant barrier to using IPM practice,s and identification as an elementary school district. In contrast, the probability of adopting an IPM program increases significantly with higher scores on the information use scale.

Contribution of Significant Barriers and Resource Use to Models Predicting the Four Policy and Practice Scales

Earlier in this chapter, analytical models assessed the relative contributions of district characteristics in predicting scores on the four policy and practice scales (Tables 5.4-5.7). Since barriers to using IPM practices and use of IPM information resources were both significantly related to three of these scales (weed management being the exception), the use scale and specific barriers rated as “very significant” by respondents were added to the models. This addition improved the prediction of district scores on the HSA scale by 7 percentage points (Table 5.17). The addition improved the prediction of scores on the IPM program and ant management scales by approximately 3 percentage points. Thus, using IPM information resources and barriers to using IPM practices are both important factors for IPM policies and practices in California’s school districts.

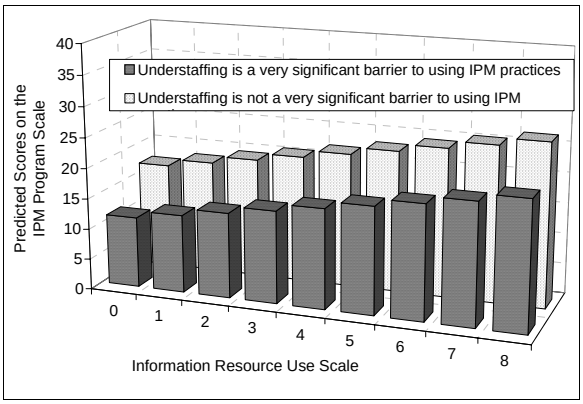
Healthy Schools Act scale. The information resource use scale is one of the most important variables in the HSA scale model (Figure 5.10 and Table 5.17). As scores on the information use scale increase, so do scores on the HSA scale. This relationship is particularly strong for districts that have not adopted an IPM program. Districts that have adopted an IPM program score relatively high on the HSA scale, regardless of their score on the information use scale. The new model explains 31.1% of the variance, compared with 23.8% before the addition of the information use scale. None of the barriers to using IPM practices were important in this model. The other significant variables in the model remain the same with or without the information resource scale. Consistent with the model presented in Table 5.4, scores on the HSA scale increase along with scores on the IPM program scale and decrease with cost per ADA. School districts with high per student costs are less compliant with HSA requirements.

Figure 5.10 Mean Scores on the Healthy Schools Act Scale by Scores on the Information Use Scale and IPM Program Adoption



IPM program scale. Understaffing and use of information resources are both significantly related to scores on the IPM program scale (Table 5.17). Figure 5.11 shows that districts where understaffing is a very significant barrier to using IPM practices have lower scores on the IPM program scale. The figure also shows that as scores on the information resource use scale increase, so do scores on the IPM program scale.

Figure 5.11 Predicted Scores on the IPM Program Scale by Significance of Understaffing as a Barrier and Information Resource Use Scale Scores



The other significant variables in the model remain the same with or without these two new variables. Consistent with the original model shown in Table 5.5, IPM program adoption remains the most important variable for predicting scores on the IPM program scale. The HSA scale and ADA are still significantly related to the scale, but they are slightly less important in the new model than either of the two new variables. Understaffing is the second most important variable in this model and the information resource use and HSA scales were third and fourth respectively (Table 5.17). Adding these two new variables explained 20.6% of the variation in this scale, compared to 17.2% without them (Tables 5.5 and 5.17).

Ant management scale. The model for the ant management scale was strengthened by the addition of the understaffing variable (Table 5.17). Districts where understaffing is perceived to be a very significant barrier to using IPM practices have lower scores on the ant management scale. This new model with understaffing explains 19.5% of the variance, compared with 16.7% without it. The other significant variables in the model remain the same with or without understaffing. As in the earlier model shown in Table 5.6, high scores on the IPM program and HSA scales are related to higher scores on the ant management scale, and districts in rural areas inside MSAs have lower scores on the ant management scale.

Table 5.1 Adoption of IPM Program by District and Respondent Characteristics

		Has district adopted an IPM program?						If yes, how many years ago did district adopt an IPM program?					
		Yes	No	Not sure	Total	*N*	p^1	2 or less	3	4 or more	Total	*N*	p^1
Population area	Large city	86%	5%	10%	100%	*21*	.005	15%	31%	54%	100%	*13*	.105
	Urban fringes of large city	74%	16%	10%	100%	*185*		27%	35%	37%	100%	*113*	
	Mid-size city	75%	22%	4%	100%	*51*		30%	48%	21%	100%	*33*	
	Urban fringes of mid-size city	65%	23%	12%	100%	*60*		30%	27%	43%	100%	*30*	
	Large or small town	82%	8%	11%	100%	*38*		43%	32%	25%	100%	*28*	
	Rural, inside MSA	55%	23%	22%	100%	*77*		50%	24%	26%	100%	*38*	
	Rural, outside MSA	60%	17%	23%	100%	*78*		44%	23%	33%	100%	*39*	
Region	North Coastal	67%	18%	15%	100%	*39*	.103	30%	30%	40%	100%	*20*	.268
	Sierra	71%	11%	17%	100%	*63*		40%	23%	38%	100%	*40*	
	North Central	63%	23%	15%	100%	*40*		38%	42%	21%	100%	*24*	
	Bay Area	74%	18%	8%	100%	*73*		47%	28%	26%	100%	*43*	
	Central Valley	69%	18%	13%	100%	*100*		34%	36%	30%	100%	*56*	
	Central Coastal	43%	32%	25%	100%	*28*		56%	11%	33%	100%	*9*	
	LA/Surrounding Area	76%	16%	8%	100%	*117*		23%	41%	36%	100%	*74*	
	South Eastern	62%	16%	22%	100%	*50*		29%	25%	46%	100%	*28*	
District type	Elementary	68%	16%	15%	100%	*268*	.010	40%	30%	30%	100%	*151*	.162
	High School	90%	6%	4%	100%	*48*		31%	42%	28%	100%	*36*	
	Unified	64%	22%	13%	100%	*194*		27%	33%	40%	100%	*107*	
Number of schools in district	2	57%	21%	22%	100%	*99*	.021	43%	33%	24%	100%	*46*	.055
	3-4	65%	17%	17%	100%	*75*		49%	22%	29%	100%	*41*	
	5-9	68%	19%	14%	100%	*145*		33%	28%	39%	100%	*79*	
	10-19	78%	16%	6%	100%	*114*		32%	38%	29%	100%	*78*	
	20 or more	77%	14%	9%	100%	*77*		18%	38%	44%	100%	*50*	
ADA	Under 500	55%	23%	22%	100%	*132*	.000	49%	26%	25%	100%	*61*	.021
	500-2,499	66%	18%	16%	100%	*128*		35%	29%	36%	100%	*69*	
	2,500-7,499	77%	13%	9%	100%	*119*		37%	29%	34%	100%	*76*	
	7,500 or more	78%	15%	7%	100%	*131*		20%	42%	38%	100%	*88*	
Cost per ADA	Under $6,300	69%	22%	9%	100%	*137*	.079	32%	39%	29%	100%	*79*	.528
	$6,300-$6,699	74%	15%	12%	100%	*130*		36%	26%	38%	100%	*86*	
	$6,700-$7,399	71%	13%	16%	100%	*117*		31%	37%	31%	100%	*67*	
	$7,400 or more	61%	21%	18%	100%	*126*		37%	27%	35%	100%	*62*	
Attended DPR IPM training in 2002 or 2003	Yes	80%	13%	7%	100%	*60*	.115	37	28	35	100%	*43*	.788
	No	67%	18%	14%	100%	*450*		34	33	34	100%	*251*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.2 Logistic Regression Model for Adoption of IPM Program

		B	S.E.	Wald	Exp(B)
District type	High School	1.807**	.665	7.370	6.090
	Unified	-.346	.258	1.800	.707
ADA (in thousands)		.123**	.047	6.782	1.131
Interaction terms for ADA and district type	High School	-.141*	.068	4.288	.868
	Unified	-.081	.149	2.675	.922
Constant		.498**	.157	10.013	1.646
-2 Log likelihood		598.1			
Cox & Snell R Square		.066			
Nagelkerke R Square		.093			
df		5			

Elementary school districts are the reference category.

* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.3. Mean IPM Scale Scores by District Characteristics

		Healthy Schools Act Compliance Scale			IPM Program Scale			Ant Management Scale			Weed Management Scale		
		Mean	*N*	p^1	Mean	*N*	p^1	Mean	*N*	p^1	Mean	*N*	p^1
Population area	Large city	37.3	*22*	.000	25.5	*19*	.000	98.8	*18*	.000	71.3	*22*	.127
	Urban fringes of large city	35.2	*177*		20.8	*170*		89.5	*171*		67.9	*182*	
	Mid-size city	36.0	*48*		20.2	*46*		96.7	*45*		63.7	*52*	
	Urban fringes of mid-size city	33.5	*60*		17.0	*57*		93.9	*54*		66.1	*60*	
	Large or small town	36.7	*33*		21.6	*34*		97.8	*31*		73.3	*35*	
	Rural, inside MSA	30.9	*70*		16.2	*72*		73.4	*50*		68.2	*72*	
	Rural, outside MSA	28.3	*72*		16.6	*68*		82.3	*55*		79.0	*74*	
Region	North Coastal	30.9	*32*	.007	21.8	*33*	.031	100.8	*25*	.044	88.4	*34*	.000
	Sierra	32.9	*63*		17.2	*59*		90.8	*53*		73.4	*60*	
	North Central	31.0	*39*		16.4	*36*		76.5	*34*		54.7	*41*	
	Bay Area	32.6	*70*		19.0	*67*		86.6	*64*		70.7	*72*	
	Central Valley	35.2	*95*		18.4	*91*		83.9	*81*		59.2	*99*	
	Central Coastal	29.6	*25*		15.6	*26*		91.6	*20*		81.3	*27*	
	LA/Surrounding Area	36.4	*114*		21.1	*107*		93.3	*102*		72.5	*114*	
	South Eastern	32.3	*44*		21.6	*47*		91.3	*45*		69.3	*50*	
District type	Elementary	33.0	*248*	.204	18.2	*242*	.088	85.3	*204*	.054	71.5	*254*	.189
	High School	36.0	*45*		20.9	*41*		93.7	*42*		62.7	*49*	
	Unified	33.9	*189*		20.2	*183*		92.1	*178*		68.5	*194*	
Number of schools in district	2	30.1	*87*	.000	16.5	*89*	.000	77.2	*56*	.002	77.2	*92*	.018
	3-4	32.3	*71*		17.9	*72*		83.7	*59*		74.8	*70*	
	5-9	32.4	*136*		17.9	*132*		89.5	*128*		68.1	*144*	
	10-19	36.1	*110*		20.7	*98*		91.2	*107*		64.0	*114*	
	20 or more	37.3	*78*		24.0	*75*		97.9	*74*		65.9	*77*	
ADA	Under 500	30.5	*120*	.000	17.3	*120*	.000	80.2	*80*	.001	78.9	*120*	.001
	500-2,499	31.8	*122*		16.6	*119*		85.2	*106*		68.4	*125*	
	2,500-7,499	35.1	*110*		19.7	*107*		90.5	*114*		68.3	*120*	
	7,500 or more	36.9	*130*		23.3	*120*		96.5	*124*		62.9	*132*	
Cost per ADA	Under $6,300	34.3	*125*	.000	19.0	*127*	.511	89.3	*120*	.930	63.5	*133*	.004
	$6,300-$6,699	36.4	*124*		20.4	*114*		89.2	*111*		66.6	*131*	
	$6,700-$7,399	32.9	*112*		19.3	*107*		90.0	*97*		71.5	*109*	
	$7,400 or more	30.7	*121*		18.3	*118*		87.2	*96*		77.1	*124*	
Attended DPR IPM training in 2002 or 2003	Yes	35.7	*60*	.112	20.6	*56*	.302	95.7	*61*	.067	67.2	*62*	.550
	No	33.3	*422*		19.0	*410*		87.8	*363*		69.8	*435*	
Has district adopted an IPM program?	Yes	36.5	*330*	.000	22.0	*316*	.000	94.1	*295*	.000	69.2	*339*	.166
	No	26.8	*85*		12.7	*83*		80.6	*71*		66.0	*83*	
	Not sure	27.7	*61*		14.5	*61*		71.1	*47*		75.9	*64*	
If yes, how many years ago?	2 years ago or less	35.2	*91*	.028	19.2	*92*	.004	86.9	*80*	.027	67.6	*95*	.010
	3 years ago	37.7	*93*		22.4	*83*		95.8	*78*		63.8	*92*	
	4 or more years ago	37.2	*94*		24.4	*93*		99.1	*89*		77.6	*95*	

[1] Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.4 Linear Regression Model for Healthy Schools Act Scale

	Standardized Beta Coefficient	Significance
Average cost per ADA	-.190	.000 ***
Adopted IPM program	.327	.000 ***
IPM program scale	.191	.000 ***
Adjusted R Square	.238	
Total df	444	

Reference categories: Urban fringes of a mid-size city, LA/Surrounding Area
* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.5 Linear Regression Model for IPM Program Scale

	Standardized Beta Coefficient	Significance
ADA	.096	.028 *
Adopted IPM program	.275	.000 ***
Healthy Schools Act scale	.200	.000 ***
Adjusted R Square	.172	
Total df	444	

Reference categories: Urban fringes of a mid-size city, LA/Surrounding Area
* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.6 Linear Regression Model for Ant Management Scale

		Standardized Beta Coefficient	Significance
Population area	Large city	-.040	.464
	Urban fringes of large city	-.115	.124
	Mid-size city	.031	.607
	Large or small town	-.011	.853
	Rural, inside MSA	-.211	.001 ***
	Rural, outside MSA	-.086	.157
Adopted IPM program		.209	.000 ***
IPM program scale		.231	.000 ***
Adjusted R Square		.167	
Total df		367	

Reference categories: Urban fringes of a mid-size city, LA/Surrounding Area
* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.7 Linear Regression Model for Weed Management Scale

		Standardized Beta Coefficient	Significance
Region	North Coastal	.094	.056
	Sierra	-.008	.871
	North Central	-.160	.001 **
	Bay Area	-.038	.459
	Central Valley	-.163	.002 **
	Central Coastal	.045	.346
	South Eastern	-.040	.422
Average cost per ADA		.122	.007 **
Adjusted R Square		.072	
Total df		496	

Reference category: LA/Surrounding Area
* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.8 IPM Program Adoption by Perceived Significance of Potential Barriers to Using IPM Practices

		Has district adopted an IPM program?				
		Yes	No	Total	*Number of cases*	p^1
Age and condition of school facilities	Not at all significant	70%	30%	100%	*201*	.725
	Somewhat significant	73%	27%	100%	*169*	
	Very significant	72%	28%	100%	*79*	
Poor communication within the district	Not at all significant	73%	27%	100%	*313*	.523
	Somewhat significant	67%	33%	100%	*102*	
	Very significant	70%	30%	100%	*30*	
Budget restrictions	Not at all significant	78%	22%	100%	*165*	.005
	Somewhat significant	71%	29%	100%	*175*	
	Very significant	59%	41%	100%	*113*	
Inadequate staff training	Not at all significant	79%	21%	100%	*218*	.000
	Somewhat significant	70%	30%	100%	*173*	
	Very significant	40%	60%	100%	*52*	
Understaffing	Not at all significant	81%	19%	100%	*150*	.000
	Somewhat significant	73%	27%	100%	*147*	
	Very significant	56%	44%	100%	*156*	
Insufficient tool/ equipment inventory	Not at all significant	81%	19%	100%	*260*	.000
	Somewhat significant	60%	40%	100%	*131*	
	Very significant	49%	51%	100%	*47*	
Lack of technical information resources	Not at all significant	81%	19%	100%	*291*	.000
	Somewhat significant	56%	44%	100%	*117*	
	Very significant	37%	63%	100%	*35*	
Contracting problems	Not at all significant	73%	27%	100%	*342*	.170
	Somewhat significant	69%	31%	100%	*75*	
	Very significant	55%	45%	100%	*22*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.9 Mean Scores on IPM Scales by Perceived Significance of Potential Barriers to Using IPM Practice

		Healthy Schools Act Scale			IPM Program Scale			Ant Management Scale			Weed Management Scale		
		Mean	*Number of cases*	p^1	Mean	*Number of cases*	p^1	Mean	*Number of cases*	p^1	Mean	*Number of cases*	p^1
Age and condition of school facilities	Not at all significant	33.7	*187*	.940	18.8	*188*	.395	88.1	*172*	.590	69.3	*201*	.837
	Somewhat significant	34.0	*166*		20.3	*158*		91.5	*145*		69.1	*166*	
	Very significant	34.1	*71*		20.3	*67*		88.3	*63*		66.8	*73*	
Poor communication within the district	Not at all significant	34.2	*298*	.643	19.9	*291*	.342	90.3	*262*	.278	68.3	*309*	.785
	Somewhat significant	33.4	*98*		18.1	*93*		86.1	*86*		69.7	*99*	
	Very significant	32.7	*26*		20.8	*26*		96.4	*26*		64.9	*27*	
Budget restrictions	Not at all significant	33.4	*157*	.468	19.4	*154*	.024	91.1	*140*	.049	70.1	*162*	.713
	Somewhat significant	34.8	*170*		20.9	*164*		91.3	*151*		67.4	*172*	
	Very significant	33.6	*103*		17.0	*99*		82.1	*91*		68.0	*109*	
Inadequate staff training	Not at all significant	35.1	*207*	.000	21.1	*203*	.000	94.5	*186*	.002	66.9	*213*	.097
	Somewhat significant	34.4	*163*		18.7	*154*		87.8	*141*		72.3	*170*	
	Very significant	28.0	*49*		14.5	*49*		77.0	*43*		62.6	*50*	
Understaffing	Not at all significant	35.1	*142*	.012	21.3	*142*	.000	92.1	*125*	.002	67.2	*147*	.539
	Somewhat significant	35.3	*137*		21.7	*130*		94.4	*124*		70.8	*146*	
	Very significant	32.2	*150*		15.2	*144*		81.4	*131*		67.4	*150*	
Insufficient tool/equipment inventory	Not at all significant	35.3	*250*	.015	21.0	*244*	.001	94.3	*220*	.000	67.8	*255*	.130
	Somewhat significant	32.5	*122*		18.6	*117*		87.2	*113*		72.2	*128*	
	Very significant	31.9	*43*		14.2	*42*		72.2	*36*		61.6	*46*	
Lack of technical information resources	Not at all significant	35.5	*277*	.000	20.9	*270*	.001	92.8	*250*	.005	69.4	*285*	.582
	Somewhat significant	32.6	*109*		17.3	*104*		87.4	*96*		67.8	*114*	
	Very significant	26.8	*34*		15.0	*33*		73.2	*26*		63.7	*34*	
Contracting problems	Not at all significant	34.3	*327*	.331	19.5	*320*	.456	90.3	*288*	.326	68.9	*336*	.669
	Somewhat significant	33.3	*70*		19.9	*65*		90.0	*67*		68.9	*74*	
	Very significant	31.1	*19*		16.5	*20*		78.4	*16*		62.5	*21*	

[1] Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.10 Mean Scores on IPM Information Resource Awareness and Use Scales by District Characteristics

		Information Resource Awareness Scale			Information Resource Use Scale		
		Mean	*Number of cases*	p^1	Mean	Number of cases	p^1
Population area	Large city	5.53	*19*	.000	3.63	*19*	.000
	Urban fringes of large city	6.12	*165*		3.76	*165*	
	Mid-size city	5.95	*44*		4.52	*44*	
	Urban fringes of mid-size city	5.69	*51*		3.14	*51*	
	Large or small town	5.91	*33*		3.27	*33*	
	Rural, inside MSA	4.96	*69*		2.46	*69*	
	Rural, outside MSA	4.37	*65*		2.08	*65*	
Region	North Coastal	4.19	*32*	.014	1.88	*32*	.000
	Sierra	5.48	*54*		3.06	*54*	
	North Central	5.33	*36*		2.61	*36*	
	Bay Area	6.12	*60*		3.87	*60*	
	Central Valley	5.70	*88*		3.68	*88*	
	Central Coastal	5.54	*24*		2.96	*24*	
	LA/Surrounding Area	5.94	*104*		3.70	*104*	
	South Eastern	5.13	*48*		2.71	*48*	
District type	Elementary	5.23	*231*	.005	2.87	*231*	.000
	High School	6.34	*38*		4.37	*38*	
	Unified	5.87	*177*		3.57	*177*	
ADA	Under 500	4.49	*116*	.000	2.05	*116*	.000
	500-2,499	5.39	*110*		2.90	*110*	
	2,500-7,499	6.17	*103*		3.79	*103*	
	7500 or more	6.32	*117*		4.39	*117*	
Cost per ADA	Under $6,300	5.57	*122*	.035	3.33	*122*	.002
	$6,300-$6,699	6.03	*115*		3.81	*115*	
	$6,700-$7,399	5.63	*98*		3.29	*98*	
	$7,400 or more	5.07	*111*		2.66	*111*	
Attended DPR IPM training in 2002 or 2003	Yes	6.23	*57*	.034	4.65	*57*	.000
	No	5.48	*389*		3.07	*389*	

[1] Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.11 Linear Regression Models Describing Relationships between District Characteristics and IPM Information Resource Awareness and Use Scales

		Information Resource Awareness Scale		Information Resource Use Scale	
		Standardized Beta Coefficient	Significance	Standardized Beta Coefficient	Significance
Population area	Large city	-.013	.805	.063	.235
	Urban fringes of large city	.085	.262	.185	.028*
	Mid-size city	.032	.590	.166	.005**
	Large or small town	.024	.680	.091	.138
	Rural, inside MSA	-.106	.102	-.056	.382
	Rural, outside MSA	-.187	.004**	-.040	.586
Region	North Coastal	Not included in model		-.086	.169
	Sierra			.031	.596
	North Central			-.083	.109
	Bay Area			.044	.393
	Central Valley			.160	.010**
	Central Coastal			.034	.502
	South Eastern			-.083	.113
District type	High School	Not included in model		.126	.007**
	Unified			.080	.096
Attended 2002 or 2003 DPR IPM training		Not included in model		.180	.000***
Adjusted R Square		.053		.162	
Total df		445		445	

Reference categories: urban fringes of mid-size city; LA/surrounding area; and elementary school district.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 5.12 Linear Regression Models Describing Relationships Between Respondent Characteristics and IPM Information Resource Awareness and Use Scales

	All Respondents				IPM Coordinators Only			
	Information Resource Awareness Scale		Information Resource Use Scale		Information Resource Awareness Scale		Information Resource Use Scale	
	Standardized Beta Coefficient	Significance	Standardized Beta Coefficient	Significance	Standardized Beta Coefficient	Significance	Standardized Beta Coefficient	Significance
Administration	-.140	.007 **	-.185	.000 ***	-.192	.001 ***	-.232	.000 ***
Front office/business	-.123	.016 *	-.161	.002 **	-.023	.662	-.100	.057
Safety/risk management	-.013	.784	.011	.828	-.049	.354	-.002	.972
M & O Manager/Supervisor	.100	.062	.115	.032 *	.069	.230	.104	.063
M & O Worker	-.015	.767	-.047	.366	-.032	.553	-.034	.520
IPM coordinator	.153	.002 **	.075	.120	n/a	n/a	n/a	n/a
Coordinator tenure	--	--	--	--	.190	.000 ***	.209	.000 ***
Adjusted R Square	.070		.083		.066		.111	
Total df	421		421		356		356	

Reference category for job category is M & O Director/Coordinator.

* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.13 Linear Regression Models Describing Relationships between Respondent Characteristics and Responsibilities and IPM Information Resource Awareness and Use Scales

		Information Resource Awareness Scale		Information Resource Use Scale	
		Standardized Beta Coefficient	Significance	Standardized Beta Coefficient	Significance
Job Level/Area	Administration	-.133	.013 *	-.190	.000 ***
	Front office/business	-.069	.196	-.105	.042 *
	Safety/risk management	-.029	.563	.010	.833
	M & O Manager/Supervisor	.084	.122	.126	.017 *
	M & O Worker	.028	.609	.028	.598
IPM coordinator		.098	.047 *	.006	.896
Responsibilities	Pest management and pesticide safety training	.185	.001 ***	.144	.006 **
	Setting pest management policies	.073	.174	.163	.002 **
	Deciding when to apply pest management treatments	.113	.075	.035	.567
	Deciding which pest management practices to use	-.030	.646	.090	.153
	Applying pest management treatments	-.045	.421	-.046	.390
	Directing others to apply pest management treatments	-.001	.977	.020	.691
	Keeping records of all pest management treatments used	.024	.653	.060	.246
	Other responsibilities	-.005	.925	.059	.213
Adjusted R Square		.102		.156	
Total df		415		415	

Reference category for job area/level is M & O Director/Coordinator.

* p ≤ .05; **p ≤ .01; ***p ≤ .001

Table 5.14 IPM Program Adoption by IPM Information Resource Awareness and Use

		Has district adopted an IPM program?				
		Yes	No	Total	*Number of cases*	p^1
DPR School IPM Web site	Have accessed	78%	22%	100%	*285*	.000
	Aware of but have not accessed	68%	32%	100%	*103*	
	Not aware of	50%	50%	100%	*103*	
Brochures/hand-outs from DPR	Have accessed	81%	19%	100%	*288*	.000
	Aware of but have not accessed	58%	42%	100%	*90*	
	Not aware of	56%	44%	100%	*108*	
Presentations by DPR staff	Have accessed	82%	18%	100%	*142*	.000
	Aware of but have not accessed	74%	26%	100%	*174*	
	Not aware of	56%	44%	100%	*157*	
Training workshops on school IPM	Have accessed	81%	19%	100%	*252*	.000
	Aware of but have not accessed	64%	36%	100%	*146*	
	Not aware of	49%	51%	100%	*90*	
Information provided by licensed pest control businesses	Have accessed	75%	25%	100%	*273*	.086
	Aware of but have not accessed	66%	34%	100%	*113*	
	Not aware of	65%	35%	100%	*96*	
University of California resources	Have accessed	81%	19%	100%	*130*	.000
	Aware of but have not accessed	76%	24%	100%	*159*	
	Not aware of	58%	42%	100%	*183*	
Information from other Web site sources	Have accessed	77%	23%	100%	*168*	.001
	Aware of but have not accessed	75%	25%	100%	*130*	
	Not aware of	60%	40%	100%	*176*	
California Department of Education, School Facilities Planning Division	Have accessed	71%	29%	100%	*101*	.004
	Aware of but have not accessed	78%	22%	100%	*169*	
	Not aware of	62%	38%	100%	*202*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.15 Mean IPM Scale Scores by IPM Information Resource Awareness and Use

		Healthy Schools Act Scale			IPM Program Scale			Ant Management Scale			Weed Management Scale		
		Mean	*Number of cases*	*p*[1]	Mean	*Number of cases*	*p*[1]	Mean	Number of cases	*p*[1]	Mean	Number of cases	*p*[1]
DPR School IPM Web site	Have accessed	36.6	*269*	.000	20.7	*259*	.001	94.4	*254*	.000	69.2	*282*	.689
	Aware of but have not accessed	31.0	*97*		18.6	*94*		82.4	*87*		70.9	*98*	
	Not aware of	28.8	*99*		15.8	*98*		79.8	*67*		72.3	*97*	
Brochures/hand-outs from DPR	Have accessed	35.8	*280*	.000	20.8	*264*	.001	95.6	*249*	.000	70.4	*287*	.542
	Aware of but have not accessed	33.9	*83*		18.7	*82*		81.0	*77*		66.5	*85*	
	Not aware of	28.6	*100*		16.0	*101*		79.9	*77*		71.3	*100*	
Presentations by DPR staff	Have accessed	37.2	*135*	.000	21.6	*128*	.003	94.9	*135*	.025	67.4	*141*	.378
	Aware of but have not accessed	34.0	*165*		19.4	*157*		89.6	*143*		70.1	*166*	
	Not aware of	30.2	*150*		17.1	*151*		84.4	*116*		72.6	*151*	
Training workshops on school IPM	Have accessed	36.3	*242*	.000	21.1	*232*	.000	93.1	*225*	.007	70.6	*248*	.791
	Aware of but have not accessed	32.6	*137*		18.1	*133*		87.4	*121*		68.3	*142*	
	Not aware of	28.2	*85*		15.8	*84*		79.8	*62*		69.3	*85*	
Information provided by licensed pest control businesses	Have accessed	35.3	*258*	.000	20.8	*252*	.001	91.9	*235*	.179	68.6	*272*	.084
	Aware of but have not accessed	33.8	*108*		18.3	*102*		85.3	*93*		67.0	*104*	
	Not aware of	28.8	*92*		16.2	*90*		87.5	*74*		76.3	*93*	
University of California resources	Have accessed	37.5	*123*	.000	22.0	*116*	.000	92.7	*126*	.017	75.6	*130*	.093
	Aware of but have not accessed	34.1	*150*		20.3	*146*		93.8	*131*		67.9	*150*	
	Not aware of	30.8	*175*		16.8	*174*		84.1	*140*		68.7	*179*	
Information from other Web site sources	Have accessed	36.9	*160*	.000	22.0	*158*	.000	95.5	*153*	.003	70.1	*164*	.857
	Aware of but have not accessed	34.1	*123*		19.3	*120*		90.6	*113*		71.7	*129*	
	Not aware of	30.4	*168*		16.7	*160*		83.1	*130*		69.8	*166*	
California Department of Education, School Facilities Planning Division	Have accessed	36.0	*97*	.001	21.4	*96*	.008	93.9	*94*	.020	71.9	*99*	.708
	Aware of but have not accessed	34.8	*163*		20.1	*156*		92.9	*147*		70.5	*168*	
	Not aware of	31.5	*188*		17.5	*182*		84.4	*154*		68.7	*190*	

[1] Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.16 Logistic Regression Model for Adoption of IPM Program Including District Characteristics, IPM Information Resource Use Scale and Barriers to Using IPM Practices

		B	S.E.	Wald	Exp(B)
Region	North Coastal	-.057	.591	.009	.944
	Sierra	-.232	.491	.223	.793
	North Central	-.461	.529	.761	.631
	Bay Area	-.216	.466	.216	.805
	Central Valley	-.577	.393	2.158	.562
	Central Coast	-2.132***	.562	14.404	.119
	South Eastern	-.603	.464	1.686	.547
District type	High School	1.547*	.785	3.880	4.698
	Unified	-.432	.276	2.457	.649
IPM information use scale		.261***	.066	15.754	1.299
Indicating that inadequate staff training is a significant barrier to using IPM practices		-1.269***	.393	10.422	.281
Indicating that understaffing is a significant barrier to using IPM practices		-.679*	.280	5.889	.507
Constant		1.112	.379	8.590	3.041
-2 Log likelihood		376.316			
Cox & Snell R Square		.192			
Nagelkerke R Square		.275			
df		12			

Reference categories are LA/surrounding area and elementary school districts.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 5.17 Linear Regression Models for IPM Scales Including District Characteristics, IPM Information Resource Use Scale and Barriers to Using IPM Practices

		Healthy Schools Act Scale			IPM Program Scale			Ant Management Scale		
		Beta Coefficient			Beta Coefficient			Beta Coefficient		
		Unstand-ardized	Stand-ardized	Signif-icance	Unstand-ardized	Stand-ardized	Signif-icance	Unstand-ardized	Stand-ardized	Signif-icance
Constant		23.890	n/a	.000	10.070	n/a	.000	79.247	n/a	.000
Population area	Large city							-4.641	-.031	.582
	Urban fringes of large city							-7.800	-.128	.097
	Mid-size city							3.079	.033	.608
	Large or small town							-2.255	-.019	.748
	Rural, inside MSA							-21.058	-.235	.000***
	Rural, outside MSA							-10.893	-.105	.087
ADA					.000	.095	.048*			
Cost per ADA		-.001	-.136	.001***						
Healthy Schools Act scale					.135	.121	.028*			
IPM program scale		.147	.154	.001***				.647	.235	.000***
Adopted IPM program		12.893	.569	.000***	4.920	.202	.000***	11.965	.180	.001**
IPM information resource use scale		2.834	.630	.000***	.719	.148	.005**			
Interaction term for IPM program adoption and the IPM information resource use scale		-2.359	.581	.000***						
Indicating that understaffing is a very significant barrier to using IPM practices					-4.469	-.195	.000***	-6.624	-.105	.044*
Adjusted R Square		.311			.206			.195		
Total df		387			349			332		

The reference category is urban fringes of a mid-size city.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Shaded areas show variables that were not included in the model because they were not significant.

Chapter 6: Trends

School district experience with the HSA and broader coverage by DPR's IPM training program should increase compliance with HSA provisions and improve IPM practices in schools throughout the state. To determine whether these positive changes have occurred, responses to the same questions were compared between at least two surveys (2002 and 2004) and sometimes three (2001, 2002 and 2004). Although a consistent increase or decrease over three points in time is suggestive of a linear trend, changes between two points in time could reflect a difference in the type of person or district responding to the questionnaire rather than changed behavior on the part of a specific set of school districts. This limitation of the trend design could not be overcome in the present study because the identity of school districts participating in the 2001 and 2002 surveys was not available and, therefore, their previous responses could not be matched with their 2004 responses. Nor was information on the respondent's IPM responsibilities included in the earlier surveys. In the future, changes can be tracked by district and controlled by the role and experience of the respondents. This will increase the likelihood that any observed changes could be tied to DPR training, district experience with the HSA, or other district characteristics.

One district characteristic—region—is available for both 2002 and 2004 studies. The regional distribution of California's school districts was virtually identical for the two years (Appendix Table 6.1). No significant difference was found between the regional distribution of responding districts. This means that it is unlikely that the observed trends from 2002 to 2004 described in this chapter are influenced by regional response bias.

This chapter describes the changes that occurred between DPR's surveys of IPM policies and practices in California's school districts. The chapter is divided into four sections, generally paralleling the 2004 survey's organizational structure. Within each section, comparisons are made over two or three survey years, depending upon the question. The 2004 survey retained seven questions from the 2001 and 2002 surveys (questions 1, 4, 10, 13, 14, 15 and 19), allowing a comparison over three survey years. Another seven questions were introduced in 2002 (questions 2, 3, 5, 6, 7, 23 and 24), permitting a comparison over two survey years. Questions that were either revised and reformatted versions of questions asked on the earlier surveys (9, 11, 12, 16, 17 and 18) or newly introduced in 2004 (8, 20, 21 and 22) are not discussed in this chapter.

IPM Policies and Practices

The HSA, reinforced by DPR's training in IPM practices, appears to have had a significant effect on school district compliance with HSA requirements and their adoption of policies supporting good IPM practices. Significant improvement occurred in each of the four HSA requirements between 2002 and 2004 (Figure 6.1 and Table 6.1). While compliance in 2002 ranged between 60% and 84%, it varied more narrowly between 77% and 92% in 2004. Mean scores on the HSA scale reinforce this trend, increasing significantly (from 29 to 33.5) while variation around the means decreased (from 13.8 to 10.8).

Figure 6.1 Percent of Districts Officially Adopting Practices Required for Compliance with the Healthy Schools Act (2002 and 2004)

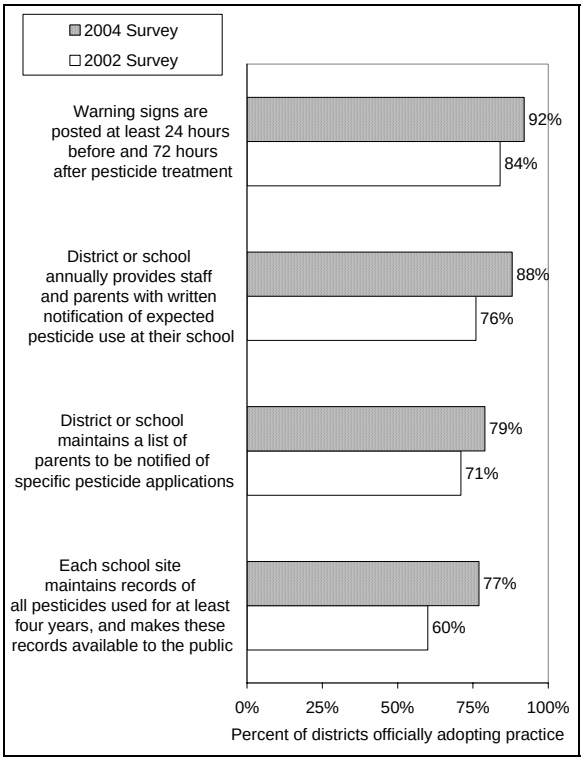
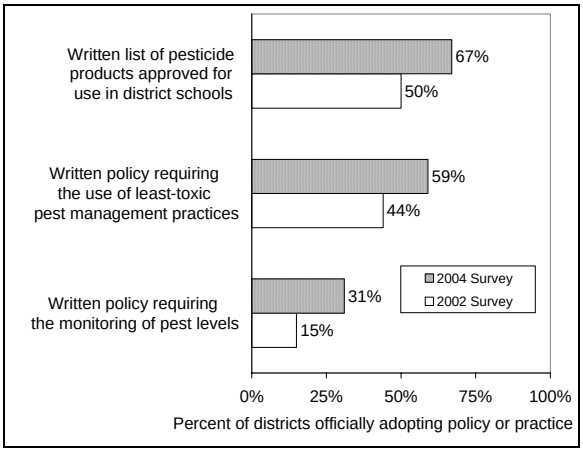


Figure 6.2 Percent of Districts Officially Adopting Additional IPM Policies or Practices (2002 and 2004)

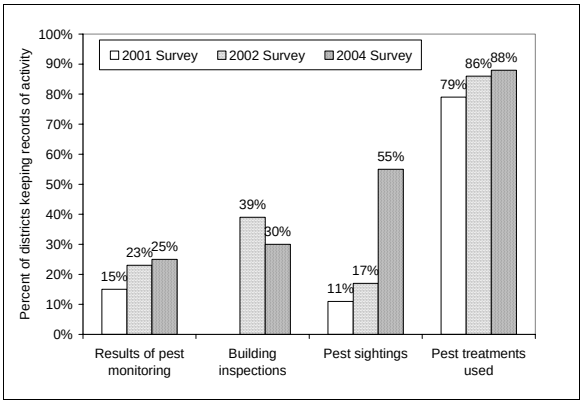


Adoption of district IPM policies also increased significantly over this two-year period. Districts were most apt to maintain a list of pesticide products approved for use in its schools (50% in 2002 vs. 67% in 2004) (see Figure 6.2). Almost as many had a written policy requiring use of the least-toxic pest management practices (44% in 2002 vs. 59% in 2004). Districts were least apt to have a policy requiring the monitoring of pest levels in both survey years (15% in 2002 vs. 31% in 2004).

While compliance with HSA requirements and the adoption of IPM-supportive policies increased between 2002 and 2004, there did not seem to be a change in the proportion of districts adopting a formal IPM program. With the passage of HSA in 2000, districts were quick to officially adopt an IPM program—70% had taken this action by 2002 (Table 6.2). The slight decline in 2004 (to 69%) probably reflects a difference in the respondents—since almost twice as many were unsure whether such a program was official policy.

Respondents in 2004 were more likely to feel that the IPM program had resulted in more effective pest management (49% vs. 41% in 2002) (see Table 6.3). However, there was no significant difference in the proportion believing that the program had reduced the long-term cost of pest management. Recordkeeping and pest monitoring activities have improved markedly over the three survey years (see Figure 6.3 and Table 6.4)). In 2001, only 11% of school districts kept records of pest sightings. A 50% increase in 2002 (to 17%) was dwarfed by a three-fold increase to 55% in 2004. Between 2001 and 2002, there was a similar proportionate increase in the number of school districts that recorded the results of pest monitoring (from 15% to 23%), with only a modest increase to 25% in 2004. The most widely used practice of all recordkeeping and pest monitoring activities is recording pest treatments used: 79% of school districts kept these records in 2001, with increases to 86% and 88% in 2002 and 2004. This indicates early and widespread compliance with the recordkeeping requirement of the HSA.

Figure 6.3 Percent of Districts Keeping Pest Monitoring Records (2001, 2002 and 2004)



Ant Management Practices

Most school districts (75% to 83%) had done something to manage ants inside school buildings in the years preceding the three surveys (Table 6.5). The question wording varied slightly in each of the surveys with the 2001 survey asking for ant management practices during the past *two* years while the 2002 and 2004 surveys asked about the preceding 12 months. However, the consistency of responses on ant management over three survey years increases confidence in the results.

Ant baits and insecticidal sprays were used by more school districts in 2001 (50% and 45% respectively) than any other practice (Table 6.5). The use of insecticidal sprays dropped in 2002 and 2004, while the use of ant baits, soapy water sprays, caulking and improved sanitation increased in each successive survey year. These changes reflect significant improvements in ant management practices. When asked which method was used most frequently to manage ants inside school buildings, respondents indicated that, in 2001, insecticides were the most common (41%)—a number that was halved in the 2002 and 2004 surveys (21% and 20%). Ant baits became the method of choice in the two later years (31% and 36%) with improved sanitation the only other widely preferred single method of managing ants (22% and 21%).

Weed Management Practices

Almost all school districts have done something to manage weeds in the years preceding the three surveys (91% to 94%) (see Table 6.6). Despite slight changes in wording and time frames, weed management is commonplace in California schools. In 2001, the most frequently used practices for managing weeds were spot treatment with herbicides (69%) and physical controls such as hand pulling, cultivating, and mowing (61%). In 2002, the same methods dominated, but the order was reversed (61% and 68% respectively). In 2004, the noticeable increase in the use of all weed management methods is probably the result of a change in question wording. In the first two years, respondents were asked which methods their district "typically" used to manage weeds. In 2004, respondents were asked whether their district *used* the following practices to manage weeds. Fewer respondents selected a practice as "typical;" many more indicated simple use of a practice. Physical controls and spot treatment with herbicides remain the most common practices (91% and 82% respectively), but over half (55%) of all districts use mulches and slightly less than half (41%) use irrigation management.

The location where weeds cause the most problems for schools has shifted from athletic fields and playgrounds to fencerows and landscaped areas. The percent of districts where athletic fields and playgrounds present the biggest weed problem decreased across survey years (32% in 2001, 22% in 2002, and 17% in 2004, see Table 6.6). Because these locations are typically the areas with the largest potential use of pesticides and the closest and most frequent contact with children, they have received greater attention in DPR's IPM training program.

In 2001, athletic fields/playgrounds and fencerows essentially tied for the most problematic location (32% and 33% respectively). While weeds in athletic fields and playgrounds became less problematic, weeds in fencerows and landscaped areas became more problematic. Fencerows were consistently identified as the location where weeds cause the most problems for schools. The percent of districts where fencerows present the biggest weed problem remained essentially constant from 2001 to 2002 (33% and 32%, respectively) and increased to 39% in 2004. The percent of districts where landscaped areas present the biggest weed problem increased steadily across survey years (23% in 2001, 29% in 2002, and 33% in 2004).

Respondent Experiences and Assessments

In the 2002 and 2004 surveys, respondents were asked which information resources on pest management in schools they were aware of or had used. There was no change in either awareness or use for the DPR School IPM Web site, DPR brochures, University of California resources, or other Web site sources (Table 6.7). However, there was a significant increase in awareness, but not use, of DPR's presentations and workshops on school IPM and the CDE's School Facilities Planning division. In contrast, there was both increased awareness (from 14% to 23%) and decreased use (from 67% to 57%) of information provided by licensed pest control businesses.

Respondents were also asked to rate their district on IPM-related issues for the past year. These included communication between district pest managers and other district staff on pest management issues, availability of technical information on pest management in schools, overall reduction of exposure to pesticides, training opportunity for district staff in pest management and contracting procedures for hiring outside pest control services. With the exception of the last, no significant changes occurred in respondent ratings (Table 6.8). Significantly more respondents in 2004 felt that their district's contracting procedures for hiring outside pest control services were "good." Ratings could not be compared for two items in the 2004 survey—use of pest prevention methods and use of pest monitoring methods—because these had been combined in the earlier survey.

Respondents reported that pest management did not generate a large number of inquiries from their communities. Most school districts (90% or more) in each of three survey years reported receiving less than seven inquiries a year regarding pest management issues (Table 6.9).

Table 6.1 Policies and Practices Officially Adopted by Districts (2002 and 2004)

		2002	2004	p^1
Practices officially adopted by district (required for compliance with Healthy Schools Act)	Each school site maintains records of all pesticides used for at least four years, and makes these records available to the public	60%	77%	.000
	District or school annually provides staff and parents with written notification of expected pesticide use at their school	76%	88%	.000
	District or school maintains a list of parents to be notified of specific pesticide applications	71%	79%	.000
	Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	84%	92%	.000
	Number of cases	418	497-513	
Healthy Schools Act Scale	Mean	29.0	33.5	.000
	Standard deviation	13.8	10.8	
	Number of cases	418	487	
Policies officially adopted by district	Written policy requiring the use of least-toxic pest management practices	44%	59%	.000
	Written list of pesticide products approved for use in district schools	50%	67%	.000
	Written policy requiring the monitoring of pest levels	15%	31%	.000
	Number of cases	418	484-500	

[1] Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the Healthy Schools Act Scale. Probabilities ≤ .05 are boxed for easy identification.

Table 6.2 Adoption of IPM Program (2002 and 2004)

		2002	2004	p^1
Has district adopted an IPM program?	Yes	70%	69%	.001
	No	23%	17%	
	Not sure	7%	13%	
	Total	100%	100%	
	Number of cases	413	515	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 6.3 Impact of IPM Program on Effectiveness and Long-Term Cost of Pest Management (2002 and 2004)[1]

		2002	2004	p^2
Impact of IPM program on effectiveness of pest management	Resulted in more effective pest management	41%	49%	.027
	Made no difference	20%	23%	
	Resulted in less effective pest management	20%	15%	
	Uncertain/no opinion	19%	13%	
	Total	100%	100%	
	Number of cases	288	357	
Impact of IPM program on long-term cost of pest management	Reduced the long-term cost	28%	33%	.120
	Had no impact on the long-term cost	25%	24%	
	Increased the long-term cost	28%	21%	
	Uncertain/no opinion	19%	22%	
	Total	100%	100%	
	Number of cases	289	356	

[1] Only districts that have adopted an IPM program were asked these questions.

[2] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 6.4 Recordkeeping and Pest Monitoring Activities (2001, 2002 and 2004)

	2001	2002	2004	p^1
Records are kept of building inspections	n/a	39%	30%	.003
Records are kept of pest sightings	11%	17%	55%	.002
Records are kept of results of pest monitoring	15%	23%	25%	.000
Records are kept of pest treatments used	79%	86%	88%	.000
Number of cases	394	418	519	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 6.5 Ant Management Practices (2001, 2002 and 2004)

		2001	2002	2004	p^1
Did district do anything to manage ants inside school buildings?[2]	Yes	75%	83%	80%	.015
	No	25%	17%	20%	
	Total	100%	100%	100%	
	Number of cases	392	418	533	
Practices used to manage ants inside buildings[3]	Insecticidal spray	45%	32%	35%	.000
	Ant baits	50%	58%	69%	.000
	Soapy water spray	18%	38%	45%	.000
	Caulk in cracks to prevent entry of ants	25%	36%	50%	.000
	Improved sanitation	n/a	63%	80%	.000
	Other	18%	22%	6%	.000
	Number of cases	296	347	429	
One method used most frequently to manage ants inside school buildings[4]	Insecticidal spray	41%	21%	20%	.000
	Ant baits	32%	31%	36%	
	Soapy water spray	12%	12%	9%	
	Caulk in cracks to prevent entry of ants	4%	4%	2%	
	Improved sanitation	n/a	22%	21%	
	Other	11%	11%	12%	
	Total	100%	100%	100%	
	Number of cases	254	321	393	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

[2] There are differences in question wording across years for this item. In 2001, districts were asked whether, within the last two years, their district treated for ants inside school buildings. In 2002, districts were instructed to skip a block of questions if they had not treated for ants inside school buildings within the last year and the responses shown here were inferred from skip patterns. In 2004, districts were asked whether they had done anything to manage ants inside school buildings within the last 12 months.

[3] There are differences in question wording across years for this item. In 2001 and 2002, districts were asked to check off all the methods they typically use to control (2001) or manage (2002) ants in buildings. In 2004 districts were asked to answer yes or no regarding whether they used each practice to manage ants inside buildings.

[4] The 2001 questionnaire asked districts "which one method do you prefer to use for ants in school buildings?" The 2002 and 2004 questionnaires asked districts which they used most frequently. In 2004, 25 districts chose more than one answer. These responses have been dropped from the distribution shown here.

Table 6.6 Weed Management Practices (2001, 2002 and 2004)

		2001	2002	2004	p[1]
Did district do anything to manage weeds?[2]	Yes	91%	91%	94%	.063
	No	9%	9%	6%	
	Total	100%	100%	100%	
	Number of cases	394	418	533	
Practices used to manage weeds[3]	Broadcast treatment with herbicides[4]	30%	23%	38%	.000
	Spot treatment with herbicides[5]	69%	61%	82%	.000
	Use of mulches[6]	25%	26%	55%	.000
	Physical controls such as hand pulling, cultivating, mowing	61%	68%	91%	.000
	Flaming	8%	7%	8%	.934
	Irrigation management	n/a	17%	41%	.000
	Other	9%	10%	22%	.000
	Number of cases	359	379	503	
Location where district typically has the most trouble with weeds[7]	Athletic fields/playgrounds	32%	22%	17%	.000
	Landscaping	23%	29%	33%	
	Rights of way	7%	4%	2%	
	Fencerows	33%	32%	39%	
	Other	4%	14%	8%	
	Total	100%	100%	100%	
	Number of cases	357	298	374	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

[2] There are differences in question wording across years for this item. In 2001, districts were asked whether, in the last two years, their district treated for weeds. In 2002, districts were instructed to skip a block of questions if they had not treated for weeds within the last year and the responses shown here were inferred from skip patterns. In 2004, districts were asked whether they had done anything to manage weeds within the last 12 months.

[3] There are differences in question wording across years for this item. In 2001 and 2002 districts were asked to check off methods typically used to control weeds. In 2004 districts were asked to answer yes or no regarding whether they used each practice to manage weeds.

[4] In 2001 and 2002 the description for this practice was "regular broadcast treatment of turf and/or landscaping with herbicides." The label shows question wording for 2004.

[5] In 2001 and 2002 the description for this practice read: regular spot treatment of turf and/or landscaping with herbicides." The label shows question wording for 2004.

[6] In 2004 the description for this practice was "use of mulches, ground covers, barrier cloth or plastic." The label shows question wording for 2001 and 2002.

[7] In 2004 athletic fields and playgrounds were included as separate categories. For this comparison, they have been combined. In 2004, 25% of the districts answering this question selected more than one location. Since multiple responses were not coded in the 2001 and 2002 data files, the 124 districts which selected more than one location in the 2004 survey were dropped from the distribution presented in this table.

Table 6.7 Awareness and Use of Information Resources Reported by Respondents (2002 and 2004)

		2002	2004	p^1
DPR School IPM Web site	Have accessed	56.9%	57.9%	.907
	Aware of but have not accessed	20.4%	20.7%	
	Not aware of	22.7%	21.5%	
	Total	100.0%	100.0%	
	Number of cases	383	503	
Brochures/handouts from DPR	Have accessed	61.4%	59.2%	.550
	Aware of but have not accessed	15.7%	18.5%	
	Not aware of	23.0%	22.3%	
	Total	100%	100%	
	Number of cases	383	498	
Presentations on school IPM by DPR staff	Have accessed	29.4%	29.4%	.005
	Aware of but have not accessed	27.0%	36.4%	
	Not aware of	43.6%	34.2%	
	Total	100%	100%	
	Number of cases	374	483	
Training workshops on school IPM	Have accessed	51.3%	50.7%	.009
	Aware of but have not accessed	22.6%	30.1%	
	Not aware of	26.2%	19.2%	
	Total	100.0%	100.0%	
	Number of cases	390	501	
Information provided by licensed pest control businesses	Have accessed	67.0%	56.5%	.001
	Aware of but have not accessed	13.9%	23.1%	
	Not aware of	19.1%	20.4%	
	Total	100.0%	100.0%	
	Number of cases	388	494	
University of California resources	Have accessed	27.3%	27.3%	.466
	Aware of but have not accessed	29.5%	33.1%	
	Not aware of	43.2%	39.5%	
	Total	100.0%	100.0%	
	Number of cases	366	483	
Information from other Web site sources	Have accessed	38.7%	35.1%	.259
	Aware of but have not accessed	22.7%	27.5%	
	Not aware of	38.7%	37.4%	
	Total	100.0%	100.0%	
	Number of cases	362	484	
California Department of Education, School Facilities Planning Division	Have accessed	24.9%	21.4%	.056
	Aware of but have not accessed	28.5%	36.2%	
	Not aware of	46.6%	42.4%	
	Total	100.0%	100.0%	
	Number of cases	369	481	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 6.8 Respondent Ratings for IPM Related Issues (2002 and 2004)

		2002	2004	p^1
Communication between district pest manager(s) and other district staff (teachers, administrators on pest management issues	Good	57.6%	56.3%	.867
	Fair	34.7%	35.3%	
	Poor	7.6%	8.5%	
	Total	100%	100%	
	Number of cases	406	496	
Availability of technical information on pest management in schools	Good	49.6%	55.6%	.190
	Fair	38.3%	34.4%	
	Poor	12.1%	10.0%	
	Total	100.0%	100.0%	
	Number of cases	405	489	
Overall reduction of exposure to pesticides	Good	73.0%	71.4%	.707
	Fair	24.8%	25.6%	
	Poor	2.2%	3.0%	
	Total	100.0%	100.0%	
	Number of cases	408	497	
Training opportunities for district staff in pest management	Good	37.9%	34.6%	.063
	Fair	45.6%	42.5%	
	Poor	16.5%	22.9%	
	Total	100.0%	100.0%	
	Number of cases	406	468	
Contracting procedures for hiring outside pest control services	Good	58.4%	67.7%	.020
	Fair	35.4%	26.7%	
	Poor	6.2%	5.5%	
	Total	100.0%	100.0%	
	Number of cases	370	434	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 6.9 Frequency of Inquiries from Community Concerning Pest Management Issues (2001, 2002 and 2004)

	2001	2002	2004	p^1
Less than 7 times a year	91%	90%	93%	.034
7-12 times a year	7%	8%	3%	
More than 12 times a year	3%	2%	4%	
Total	100%	100%	100%	
Number of cases	382	413	485	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.